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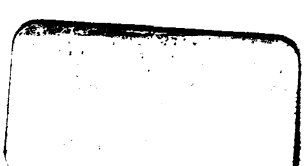

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UNITED STATES CONSULAR REPORTS.

FOREST CULTURE

IN

HESSE.

REPORT OF

JAMES HENRY SMITH,

U. S. COMMERCIAL AGENT AT MAYENCE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1888.

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CONSULAR REPORTS

ON

COMMERCE, MANUFACTURES ETC.

No. 88.—JANUARY, 1888.

FOREST CULTURE IN HESSE.

REPORT OF COMMERCIAL AGENT SMITH.

This report is a compilation of two books, which I understand to be official publications of the Hessian Government, and I think will be found to contain the statistics and general regulations of that Government governing the administration of the forests, leaving out of consideration the many ifs, buts, and howevers which must necessarily be met with in any book of regulations. There may be, however, some passages which I have omitted which another person might think of note, and I shall forward the books to the Department by the next mail for use, should a more extended abstract of them be desired to be made. Regarding the actual treatment of forest trees during growth little seems to be said. That, I suppose, is expected to be obtained from technical and scientific works on the subject, to whose study and object a consular officer has no time at command in connection with his other official duties; that is, I mean it is not introduced by the Hessian Government in the books before me, because the members of the forest service are supposed to make themselves acquainted therewith in preparing for the service. It seems to me that it would be well for the Government of the United States before initiating any forest legislation to send out experts to study the forest systems of other Governments, especially of Germany. Information thus obtained would be of far more value in practical respects than that supplied by consuls. I am led to these remarks from having met in this vicinity last winter a gentleman connected with the forest service of Russia who had been sent off for two years to inquire into and make himself familiar with the forest systems of other countries, such as Switzerland, France, Germany, etc. Speaking French and German fluently, and knowing just what he wanted, he was able to gather information of just the right kind readily.

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I.—Areas under Forest.

The Grand Duchy of Hesse, situated in the central part of Germany, lying between the degrees of 49° 24′ and 50° 51′ north latitude, and 25° 32′ and 27° 19′ east longitude, with an area of about 2,975 English square miles, divided into two parts by a narrow strip of Prussian territory, one designated as the province of Upper Hesse and the other as the provinces of Starkenburg and Rhine Hesse, has the following areas of forest land, according to provinces, namely:

Statement showing the amount of forest land in Hesse in 1883.

Provinces.	A.—Under management of foresters.					B.—Not under such management.				Total of A and B.
	Belonging to the state, state hospital, and state orphan asylum.	Belonging to the reigning family.	Share of third parties in common forests.	Belonging to communes, corporations, etc.	Total of A.	Under management of building department, etc. (pasture tracts, etc.).	Private forests.		Total of B.	
							First class.	Second class.		
Starkenburg and Rhine Hesse	*Acres.* 157	*Acres.* 76,662	*Acres.*	*Acres.* 148,072	*Acres.* 224,891	*Acres.* 3,415	*Acres.* 51,632	*Acres.* 64,290	*Acres.* 119,337	*Acres.* 344,228
Upper Hesse	2,562	87,237	4,277	86,527	180,603	22	81,145	6,665	87,832	268,435
Total	2,719	163,899	4,277	234,599	405,494	3,437	132,777	70,955	207,169	612,663

These are again classified, according to a census taken in 1883, into forest areas of low (or topped) medium, and high growth, as follows:

Statement showing the amount of low (topped) growth, intermediate growth, and regular forest growth, and whether governmental, corporate, or private.

	Low (topped) growth.			Intermediate growth.	High, or regular forest growth.					
	Topped oaks grown for bark.	Topped willows.	Other growth from trunks with no upper limbs.	Growth from trunks having upper limbs.	Oaks.	Birches, alders, and aspens.	Beeches and other foliaceous trees.	Pines.	Larches.	Firs, etc.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Governmental	11,080	2,225	325	2,967	19,752	1,630	84,410	40,465	332	6,300
Communal, or corporate	26,560	27	1,145	377	15,257	1,267	89,895	89,747	495	10,660
Private	28,237	1,377	3,970	3,362	4,832	1,500	72,867	76,960	1,312	12,201
Total	65,877	3,629	5,440	6,706	39,841	4,397	247,172	207,172	2,129	29,161

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This would make the relative proportions as follows:

	Per cent.
Young oaks for bark	10.8
Topped willows	0.6
Other growth without upper limbs	0.9
Low growth	12.3
Growth from trunks with upper limbs	1.1
Medium growth	1.1
Other leaf-bearing trees:	
Oaks	6.5
Birches, alders, and aspens	0.7
Beeches and other foliaceous trees	40.4
Pines	33.9
Larches	0.4
Firs	4.7
High growth, consisting of 47.6 per cent. of foliaceous trees and 39 per cent. of coniferous trees	86.6
Total	100.0

II.—Common Forests.

The Government informs me that in Hesse there are no forests for common use.

III.—Organization and Functions of Forest Bureaus.

The forests of the duchy are all under a forest-police control.

The entire Grand Duchy of Hesse is divided into nine forests, which I shall always refer to as districts, and these again into seventy-one divisions, which I shall designate as ranges, and in addition there are twenty-one provisory forests in baronial precincts where there are no state or Crown lands, and where there are no communal forests of sufficient size to form forest districts under the direction of the state. Each division of a district or range is again subdivided into smaller circuits or tracts, which I shall speak of as keeps, directed by an ordinance of 1823 to consist, on the average, of 500 hectares (1,235 acres) of forest land in each case, with certain exceptions. The officers I shall name as follows: Over the large districts, chief foresters; over the divisions or ranges, rangers; for the circuits or small tracts, keepers. These are all under the management and control of a bureau in the finance department of the Government called "the bureau for forest and cameral administration," which is in turn subject to the department under which it is placed. In certain cases the department of the interior and justice has also jurisdiction.

The forests are known as Crown or state, communal, and private. The Crown or state forests belong partly to the reigning house and partly to the state—mostly to the former—and are, of course, administered by the Government. Communal forests are those belonging to communes, corporations, societies, churches, and the like. These are governed pretty much in the same way as the aforementioned, except that the bureau for forest and cameral administration is in their case placed under the direction of the department of the interior and justice. With respect to their technical management the

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officials of the communes, etc., have only an advisory voice.* The communes pay into the state treasury for compensating the rangers 1.07 mark (25 cents) per hectare (2½ acres). The private forests are left to the control of their owners, but no partition or rooting up of them can take place without ministerial approval. They are known as private forests of the first and second classes, the proprietors of the first mentioned having men to manage them recognized by the state as experts, and the second being of a nature not to require such supervision.

The ranges embrace Crown, communal, and private forests, together with cameral lands, according to convenience.

The keeps consist sometimes only of Crown forests, sometimes only of communal or private forests, and sometimes of both together. In Crown forests they are organized by the upper forest officials, with the approval of the state. In the baronial and private forests of the first class the owners have the right of organization; in the other private and communal forests the organization is effected by the bureau for forest and cameral administration, in conjunction with the respective bailiwicks, with the understanding, however, that they are to be governed as a rule by the wishes of the local officials of the place.

All keepers, with the exception of those employed in baronial and private forests of the first class, have to pass an examination before appointment. They must be able to read with ease both written and printed matter, readily pronounce figures; write down with rapidity, exactness, and clearness dictated sentences; enter into the proper blank form notice of a trespass; be familiar with the four leading rules of arithmetic, fractions, and decimal fractions, and have knowledge of the chief regulations concerning the administration of the forests. The names of aspirants for positions in communal forests and private ones not of the first class are presented by the owners thereof to the Government for appointment, which confirms when there is no objection. Their pay is also regulated in a similar manner. An appeal lies to the department of the interior and justice in each case.

Owners of baronial and private forests of the first class appoint their foresters without any intermeddling on the part of the state. Aspirants for appointment into the forest service of the state, after having passed a satisfactory examination, are employed on trial for six months before receiving a permanent appointment. During this time they are paid about 40 cents a day.

The keepers in the Crown forests of regular size, with respect to salary, are divided into three classes, sixty-two in the first, fifty-eight in the second, and fifty-three in the third, the first receiving about $250 a year, second about $225, and the third about $200, and are promoted from one class to another generally, according to length of service. In the keeps of irregular size the keepers are paid less than the foregoing, and according to size of charge. The pay of the keepers in the service of communes and corporations is regulated by the state, and also in the case of private forests sometimes. When the dwelling places they inhabit are the property of the Crown, keepers of the first class pay as rent about $14 a year; those of the second class, about $12; those of the third, about $11. Of one hundred and seventy-three keepers in the employ of the Crown,

*See close of report for further information in regard to them

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eighty have such houses. And where there is pasture and farm-land they receive for a small rent enough to carry on farming on a small scale.

It is the duty of the keepers to keep a strict watch over the small tracts confided to their care, and to superintend all work done in the forests, especially wood felling. They are expected to make daily rounds, and even nightly when necessary, of the respective keeps, to prevent, detect, and stop all trespassing, bring the trespassers to justice, look after and keep in good condition all ways, boundary marks, etc., to provide against forest fires, and see to their extinguishment when they arise, to keep themselves posted as to the increase of all insects, birds, and animals injurious to forest trees, report their presence, and adopt and recommend means for their diminution, and to note all causes prejudicial to their respective forests.

With a view to discourage trespassing and fixing trespassers, they are expected to make themselves familiar with the names and faces of all people living in their districts, and with the arts and practices of trespassers. They must also aid one another in the discharge of their duties. They are required to be men of character, with a reputation in the localities where they dwell, and exercise their functions for respectability and correctness of deportment, not given to drunkenness, or to such attendance on public houses, or such conduct as would cause the public to regard them with disfavor. They can not accept any other official position without the express permission of the Government, or additional service, nor undertake particular superintendence of forests within or without their districts not prescribed by their instructions, nor undertake any special care of game.

They are not allowed to deal in wood or coal, and are forbidden to make charcoal for themselves and sell it, and without special permission are not allowed to give wood to others. They are prohibited from collecting brush and fire-wood, or cutting or pulling up grass, unless specially permitted to do so, nor can they do any business or engage in any kind of enterprise that will interfere with their duties as keepers of the forest. They are not allowed, as a rule, to have anything to do with the money matters of their forests. At auctions of forest products they can not bid for themselves or others. Under certain conditions they can use the forest pastures. Waste and litter they can only take in Crown forests with the permission of the finance de partment of the Government.

Whatever rights they enjoy in common with other members of the community in which they live respecting the forests prior to their entry into the forest service they continue to hold as keepers, unless indemnified for their withdrawal. In private forests the assent of the proprietors is all that is necessary as a rule to grant rights to the use of wood, etc., but the Ducal Government has the right to forbid the exercise of any grant which seems disadvantageous to the service. Lastly, they are not allowed to receive presents, rewards, or recognitions of any kind for services rendered in the discharge of their official duties without the approval of the Government.

The keepers are subject immediately to the rangers of their districts, and mediately to the chief forester. Carelessness in the discharge of their duties or willful violations subject them to fines and supervision or dismissal from the service, and even to legal process. They have to report to the rangers as often as is called for by their instructions and duties, and to give notice of all occurrences in their keeps, lay before them their memorandum books and trespass lists,

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and make such communications as they may be called upon from time to time to render. As a rule they are required to lay all matters before the rangers over them, and only before the chief foresters when it is something that concerns the former or has been neglected by them, or when, in case of danger from delay, decisions can be obtained quicker from the district offices.

The keepers have to manifest the same zeal and faithfulness in the case of communal and private forests as in those belonging to the Crown, and to show no partiality. They have to keep the owners of communal and private forests or their representatives apprised of what is going on in them. They are to be governed by the views and desires of the local offices of the place where the forests are situated so far as they concern their official duties, and do not conflict with instructions from higher authorities. They are required to report as faithfully to the rangers all acts done by the owners or administrators of communal and private forests in conflict with the forest laws and regulations of the Duchy as acts of trespass and depredation committed by those who have no right to the forests.

They can carry hunting arms when it is not prohibited by the Government. Side arms they are allowed to carry only when in uniform. To carry pistols they must get permission from the Government.

All official papers and articles they have to carefully preserve when of that nature, and turn over to their successors in office.

TRESPASSING.

The keepers are instructed to endeavor to come upon all trespassers while in the act of committing a trespass, and to prevent its completion. The State asks prevention rather than the report of trespasses. The activity of a keeper is not judged by the number of cases of trespasses he reports, but by the prevention and absence of them in his district. When it is possible, they are to accost trespassers and to loudly call out their names when they are known, and when not to ask for them. They are to take away stolen articles in coming upon the deed only when the articles are of importance in proving the offence or can be well used by the proprietors of the forest, or when by doing so a material damage can be avoided. The keepers have to bring to a place of safety or leave in the forest all articles taken from trespassers or left behind by them, and to force trespassers to carry back stolen objects to the places from which taken by them when it can be done.

From poachers and others carrying arms in the forest without authority they are to demand the surrender of their weapons, and to take them away when it can be done without the employment of force. All cattle running at large without any known shepherd they are to have turned over to the police. When in carrying out their instructions they find it necessary to be supported by others they are to appeal to their rangers for assistance, and in pressing cases call in the aid of the gendarmerie, wood-cutters, etc. In preventing and stopping trespassers and depredations they are enjoined not to maltreat or do violence to any one, but in cases of extreme necessity they have a right to use arms. When arms are made use of they must at once inform their rangers and the proper courts thereof. To their victims they must render all needful assistance as soon as they can do so with safety to themselves, and if the result of the use of weapons

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can not be ascertained, the police are to be requested to aid in discovering it.

The forest keepers have to always carry with them a hammer provided with a stamp like this, F, which serves as a symbol of office, and is used in stamping wood taken from trespassers of sufficient size or having the appearance of having been improperly felled, as evidence of their official action.

It is the duty of the keepers to fix the author of every trespass and obtain proof of the trespass. In doing so they are allowed to traverse forbidden ways, and to stop suspicious vehicles, animals, or persons by which wood or other forest products are being transported, and conduct them to the police, when they can do so without exercising force or creating tumult, and search houses in pursuit of stolen objects. This latter can be done at night, only when the capture of a trespasser or of his spoil brooks no delay.

Either to or from a house searching they can take forest products to make comparisons for purposes of identification. The police are required to render the keepers assistance in house searching when asked.

The keepers receive from the rangers a bound memorandum book for the pocket, with printed forms for noting down trespasses and offenses. In this book they have to note down, immediately upon discovery of a trespass, whether the author be known or not, and a brief description of the trespass committed, so far as they have learned it, so that they can enter it in their trespass lists reliably and fully. Where possible, they must put in their memorandum books the time of discovering the trespass, the name and place of residence of the author, the place where it was committed, and the things trespassed upon, mentioning the kind of wood, amount, dimensions, value, etc. Each trespass is to have a separate running number, each series of numbers to run through a memorandum book, and a new series to begin in a new book only. These memorandum books are to be numbered on their title pages, and on their covers are written the dates of their commencement and conclusion. These books belong to the official effects of the keepers. The entries of each day are required to be kept separate. The keepers have to always have their memorandum books with them. They not only have to show it to the rangers for revision, but to let other keepers see it in reference to the connection of trespassers to one another.

They are expected to be particular about names. If through their delay or negligence they fail to obtain names of trespassers and a description of their acts, they themselves will be called upon to bear the cost of inquest. Within twenty-four hours after notes are made in their memorandum books they must write out the whole matter in full in ink in their trespass lists in the following form:

Place, ——. Section, ——. Term of forest court, ——, 18—. Keep, ——. Month, ——.

Running number.	Date of the discovery of the trespass.		Family and Christian names of the accused; character of the offense; estimate in figures of value and damage.	Owner of forest and place of trespass.
	Month and day.	Time of day and hour.		

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They are forbidden, under a heavy penalty, to change or strike out anything once written in their trespass-book, be it favorable or unfavorable to the accused. If new circumstances afterward come to light they enter them in a new place and refer thereto where the first notes are. The keepers have to have a particular leaf for each place. These lists of trespasses or certificates that no trespass has taken place the keepers have to render once a month to their immediate superiors, in person, if possible. At the same time with the rendition of their lists of trespasses, keepers appointed or confirmed by the State have to submit for each term of the forest courts tabular statements like the following:

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Range ——.] [Keep ——.

TABLE A.—*List of trespasses committed in the forest judicial year* 18—, *whose authors have not been discovered.*

Forest court term.	Name of district.	On dressed wood.										On growing wood.								On side products.			
		Hard foliaceous wood.				Soft foliaceous and coniferous wood.				Estimated value.		Hard foliaceous wood.		Soft foliaceous and coniferous wood.		Estimated amount in burdens.*	Estimated.			Green grass.	Straw.	Estimated value.	
		Fire-wood.		Building wood and timber.		Fire-wood.		Building wood and timber.				Predominating.	Growing under other growth and dry.	Predominating.	Growing under other growth and dry.		Value.		Damage.				
		Cubic feet.	Burdens.*	Pieces.	Cubic feet.	Cubic feet.	Burdens.*	Pieces.	Cubic feet.	$	Cts.	Trunks and limbs over 2½ inches in diameter.					$	Cts.	$	Cts.	Burdens.*		$	Cts.

* What can be carried on the back.

Range ——.] [Keep ——.

TABLE B.—*Exhibit of trespass announcements during the forest judicial year* 18—.

Forest court term.	Number reported.				Of those reported there concern—								The trespasses in the keep, whose authors have not been discovered, amounted in value to:						Remarks of the ranger concerning the activity of the reporting keeper during the year.
	Total.	Discovered or established.			Wood trespass:					Pasture.	Grass.	Straw.	Other.	Dressed wood.		Growing wood.		Green grass and straw.	
		By day.	By night.	Through house searching.	Dressed wood.	On green wood. With.	On green wood. Without.	On dry wood.	Total.	Of these was committed with instruments—	Trespass.			$	Cts.	$	Cts.	$	Cts.	
						Damage.														

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During the first five terms of court the rangers, after inspection, return these tables to the makers, who have to enter on the same sheets all the results of the six terms, and on rendering for the last have to sum up the whole. The rangers then examine the whole and note the activity of the keepers. Where the keepers make very frivolous charges, accompanied by the discharge of persons implicated, they are severely punished and made to bear the costs of the proceeding.

In order to show their activity and the degree of trespassing, keepers, in addition to the two tables already given, are required to make out two other tables like the following:

TABLE C.—*Exhibit of forest trespasses reported in judicial year* 18—.

Forest.——.] [Range ——.

Description of trespass.	Number of the cases of trespass reported by the keepers of the district.	Of other complaints.	Total number of cases of trespassing.	The trespasses whose authors could not be learned amounted in value to—						
				On dressed wood.		On growing wood.		On green grass and straw.		In the forest keep.
				$	Cts.	$	Cts.	$	Cts.	

TABLE D.—*Exhibit of the cases of trespassing reported to and passed upon by the forest courts in* 18—.

Forest ——.] [Left arrangement.] [Forest judicial district.

Ranges.					Of the trespasses reported these relate to—							
	Size.				Trespassing on wood.					Pasture.	Grass.	Straw.	Other.
Name.	Demesne.	Communal.	Private.	Total.	On dressed wood.	On growing wood.		On dry wood.	Total.	Of which were committed with instruments.				
	Forests.					With.	Without.				Trespass.			
	Acres.					Damage.								

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TABLE D.—*Exhibit of the cases of trespassing reported, etc.*—Continued.

[Right arrangement.]

Summary of notices of trespass.	Average number per hectare.	The forest courts adjudged.		Fine in money.	Imprisonment.	The trespasses whose authors could not be learned amounted in value to—					
		Indemnification for actual value.	Indemnification for damages.			Dressed wood.		Growing wood.		Green grass and straw.	
		Dollars.	Dollars.		Days.	$	Cts.	$	Cts.	$	Cts.

Table A is to be made up at the end of each year by the rangers, and to be submitted to the chief foresters with the two tables just referred to by me. So soon as the registers and records of the decisions of the general courts in special cases of investigation have been received by the chief foresters after the rendering of sentences these rangers have to extract therefrom the damages recognized and the fines and penalties imposed, and enter them in the table whose form is last given, when they are further filled up by the bookkeepers.

The chief foresters are required to examine Tables A, B, and C, and see that they are correct and send them, before the end of July of the next year, with Table D, to the directive offices, at the same time calling their attention to the irregularities.

The rangers are expected to see to it that the instructions given to the keepers are carefully observed, and particularly that they are enterprising in the discovery and prevention of trespasses.

Whenever trespassing accompanied by force takes place, especially combinations for trespassing, the local forest authorities, particularly the rangers, have to collect together the keepers and other persons employed in the forests and proceed against the culprits. When this is not sufficient, gendarmes or military are called for.

The keepers have to appear at the forest courts, when called upon to do so by the rangers, in uniform. They have to superintend prison workmen laboring in the forest when directed to do so, report all absentees and delinquents to the rangers, and keep a record of the work done.

The keepers in the private forests belonging to their districts have to see to the protection of trees and give notices in the same way as in governmental and communal forests, and they are to notify the rangers promptly of any acts committed in them contrary to the laws of the state.

The keepers are also enjoined to aid the rangers in all subordinate forest affairs where mere mechanical and unskilled under-work is concerned, so far as their special duties protective of the forest admit of it.

The keepers have to keep themselves informed of the amount of wood intended for delivery. In the absence of the wood stackers or bosses, the keepers have to count or measure off, by direction of the

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rangers, wood or other forest products intended for delivery. The keepers receive each year, for the governmental forests, as well as for each communal forest, two so-called number books—one for building wood and timber and one for fire-wood—in which to keep an account of the wood delivered, etc.

In counting off wood in the governmental forests the following rules have to be observed:

The rangers, with the aid of the keepers, have to see that the right quantity of wood is felled and counted off in each case, and to stamp it with their hammers. An entry of the quantity sold has to be made in the number book without delay as soon as it is ready for delivery, and the number book must be compared with the delivery checks of the bosses and made to agree, and at once handed to the rangers, who sign a record of the count. In counting off wood a ranger has to call to his side the keeper of the place, the particular wood stackers, and the superintendent of the wood cutters. In counting off, the keeper usually has his two number books in his hands, and the ranger a statement of the count; the former enters each number in his book, and the ranger does so in his statement, or checks it off if it is already there; or the ranger can take the number book himself and carry it home and there make the comparison, after the entry in the number book by the keeper and himself. When standing wood, or wood not completely assorted, is delivered, its value must be carefully estimated, and entered in the number book in a similar manner to the foregoing, with the remark in what state delivered.

When the chief rangers make an inspection of a control character the keepers have to be present, but the rangers hold the number books. The rangers' statements of counts the keepers have to sign with them. In the case, too, of small fellings, up to the amount of 12 solid meters, the keepers have to be present at the counting and enter these, as well as all and every piece of wood felled or delivered, and also that carried off by trespassers, in their number books, and certify to them in the quarterly statements. All counting of bark, and litter, and such things, the keepers have to attend at the direction of the rangers, and enter the results in their books in accordance with the facts, and certify thereto with the rangers in the statements of the latter.

The foregoing regulations with respect to counting off wood apply also to communal forests. After a comparison of the figures of each felling, the keepers turn their number books over to the burgomaster, or representative of the proprietor of the forest, to make up the record. After a count has been made the number books, as well as the statement of the count, have to be signed by the ranger, burgomaster, and keeper concerned.

After a count is completed the keepers receive back their number books.

When at the close of the fiscal year natural stock is on hand, a statement to this effect is to be drawn up by the burgomaster, controller, and keeper together, and the reason given why it exists, and the return attached to the financial report of the commune for the year.

The keepers are charged with seeing that forest products are taken away only by those who have a right to them; and without their knowledge is no wood, etc., to be carried off.

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The delivery of wood is governed by the following instructions:

None is to be delivered until properly counted off and converted into natural receipts, except small wood gathered up on certain days by those enjoying the right.

None to be carried from the governmental forests until so directed in writing by the rangers, except in the following instances:

(1) The keepers, without waiting for the concurrence of the rangers, can dispose of and deliver wood taken from trespassers up to a meter when the circumstances are such that it can not be brought to a place of safety, but they are to inform the rangers of such action within eight days thereafter, and to make a note of it in their number books and in their trespass lists. The rangers can also at once dispose of wood taken from trespassers which the keepers have failed to turn to account, without previously entering it in their quarterly statements, when it is not adapted for auctioning off and does not amount to more than 12 solid meters, and likewise do the same with wood thrown down by the w nd and other causes; and the keepers can deliver such wood at the verbal direction of the rangers without waiting for delivery checks. The keepers can not dispose of wood cast down by natural causes, but must inform the rangers of its existence.

In communal forests the burgomasters, and in forests belonging to corporations their representatives, take the place of the rangers with respect to the writing of orders for the delivery of wood and the making out of receipts.

It is the duty of the keepers to see that the buyers and renters of pieces of forest ground or of forest rights conform to the conditions under which made. All violations they report to the rangers.

When keepers are required to absent themselves from their keeps their duties are usually attended to by wood stackers or bosses.

RANGERS AND CHIEF FORESTERS.

For the higher positions in the forest service a certain degree of education is demanded. A candidate is required to show that he has creditably passed through a grammar school, as well as spent three years at a university. At the university he must have passed two examinations, a preliminary one and a professional one. The preliminary examination must embrace: (1) pure mathematics, including algebra, analytical geometry, and the elements of differential and integral calculus; (2) field surveying; (3) physics, including mechanics; (4) chemistry, technical chemistry; (5) universal botany, forest botany, and forest climatology; (6) geognosy and the nature of forest soils.

The professional examination must embrace: (1) science of forestry, encyclopedia, and methodology of the science of forest cultivation, including forest history, further forest cultivation, protection (including a knowledge of forest insects), usufruct, forest technology, regulation of forest products, forest calculation and statistics, building of forest roads, forest surveying, forest partition, measurement of wood, forest economics; (2) social economy, theoretical national economy, and chief principles of science of finance; (3) science of agriculture; (4) chief principles of public and private law.

Both examinations take place before the examiners of the state university. Upon passing the second examination the candidate serves a year in the bureau of forest and cameral administration

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of the financial department of the Government, and is then put for another year in the office of a ranger or chief forester. Then comes the examination by the state, which is similar to the second examination at the university, with the addition of a test of the candidate's familiarity with the general laws and regulations of the duchy and Empire regarding the forests, drawing of plans, and execution of a practical problem, especially in the forest, such as surveying, valuation, etc.

After successfully passing the state examination, the candidates receive the title of forest assessors. These have to bring proof of their employment. When they are used as assistants they receive about $1.20 a day; when as rangers, about $1.42. For surveying, etc., they are generally paid according to a fixed tariff. They are promoted to be rangers by appointment of the grand duke. Of rangers there are 71, and of chief foresters 9. These are divided into 5 classes of 16 places, each receiving $1,071, $952, $833, $714, and $595 respectively, the chief foresters belonging only to the first two classes. Besides the sums named, each ranger is allowed for office expenses about $95 a year, and each chief forester about $190. These amounts are granted in the expectation that they will employ persons to do their office work for them so that they can have more time for attending to their proper forest duties. When clerical assistance can not be procured the keepers, with their consent, can be used for the purpose when it does not interfere with their regular duties, and are to be paid extra for this work. Each ranger has to keep a horse, on whose account he is allowed $166 a year for forage.

A chief forester keeps two horses, and is allowed $332 a year for forage. In the case of both rangers and chief foresters, if no horse is kept, traveling expenses equivalent to the amounts for forage are allowed them. Of other allowances, in consideration of the fact that their services are rendered chiefly away from home, each ranger receives about $36 a year; and 18 more important rangers get special allowances, the highest of which amounts to about $47 a year. The chief foresters are paid for all outside services in all the ranges of their forests about $1.42 a day as expenses, and about 71 cents for each night, with $1.42 for each night that a horse is in use. Those rangers and chief foresters who live in dwellings belonging to the state pay about $40 a year as rent.

When the rangers and chief foresters desire land to cultivate, it is granted them at moderate prices. They are not allowed to have wood free, but must pay the full tariff price for it.

Applicants for appointment into the forest service must be strong in body, have good vision and good hearing, have the full use of their hands and arms, and be able to climb mountains and go long distances in every kind of weather.

All members of the forest service wear a uniform when in the performance of their duties.

In case of transfer from one place to another chief foresters, rangers, and keepers who have families are allowed fixed sums as indemnification for general costs and traveling expenses; but nothing is allowed when the change is in consequence of a penalty imposed. Where there is no family the allowance is one-half of that made for families.

Keepers, rangers, and chief foresters are forbidden, under a severe penalty, to have anything to do with the receipt of money for wood or other forest products.

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The general instructions applicable to the keepers in regard to good character, accepting presents, dealing in wood, etc., apply also to the rangers and chief forester.

All keepers of the forests and meadows and superintendents of landed property are under the immediate control of the rangers, and each person in the forest service is under the supervision of the next higher. Every person in the forest service is responsible for the acts of those committed to his oversight. Slight offenses are reprimanded by those next in authority; grave ones are reported to the Government. The forest employés are warned, reprimanded, fined, etc. The fine for misdemeanor is usually loss of one month's pay, and for serious offenses reduction in grade or dismissal from the service.

The rangers report, as a general thing, to the chief foresters. In surveying matters, however, the rangers have to report direct to the Government and receive direct instructions; but where delays occur the chief foresters will be called upon to look the matter up, and in all cases the results of surveys will be communicated to them by the Government. The rangers have also to send to the Government at the close of each fiscal year a report of all changes in their forests during the year. In every case the chief foresters are advised of delays and furnished with copies of the rangers' reports.

The chief foresters are not required, in cases where it is their right to pass upon reports of rangers, to lay these reports before the Government before doing so. If the rangers are displeased with the instructions received from the chief foresters, and call for a presentation of the matter to the Government, it must be done; but in pressing cases the chief foresters can insist upon a compliance with their instructions, which must be obeyed by the rangers. Then the chief foresters are to make mention of the circumstances to the Government. Such reports as the chief foresters have no competency to pass upon themselves, they must lay in their original form before the Government. The instructions of the chief foresters form a part of the records of the rangers' offices.

DURATION OF SERVICE.

Those subordinate forest employés whose services are purely of a mechanical nature, such as keepers, and do not require any special scientific training, can be dismissed from the service at any time, when they have been appointed with this understanding and do not give complete satisfaction. If such persons have fulfilled their duties to the satisfaction of their superiors, and become disabled through no fault of their own, they are pensioned. If they have to be pensioned before they have been ten years in the forest service, they receive 40 per cent. of their salary. If longer in the service, 1½ per cent. is added to the 40 for each additional year.

When fifty years are served, 90 per cent. is granted. If a keeper becomes disabled from violence while in the discharge of his duties through no fault of his own, he receives from 60 per cent. to the whole of his salary as a pension. When one dies leaving a family, they receive three months' pay. Those occupying higher positions in the forest service are pensioned like all other officers of the state, with 40 per cent. of the salary when in service less than five years, and from that period up to fifty years with 40 to 100 per cent. of the salary, according to the length of service.

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IV.—Revenues from Government Forests, cost of Maintaining Forests, and Profits of Forest Cultivation.

The amounts received from wood and bark from the governmental forests of Hesse in the years 1880–'81, 1881–'82, 1882–'83, 1883–84, and 1884–'85 were as follows:

Years.	For building wood and timber, including bark.		For fire-wood.		Total.	
	Marks.	*Dollars.*	*Marks.*	*Dollars.*	*Marks.*	*Dollars.*
1880–'81	760,911.28	181,096.88	1,390,338.14	330,900.47	2,151,249.42	511,997.35
1881–'82	850,981.45	202,521.68	1,321,210.44	314,448.09	2,172,141.89	516,969.77
1882–'83	925,618.81	220,297.27	1,407,205.28	334,914.86	2,332,824.09	555,212.13
1883–'84	906,066.36	215,643.78	1,472,572.80	350,472.32	2,378,639.16	566,116.10
1884–'85	857,625.86	204,114.96	1,499,526.49	356,887.80	2,357,152.35	561,002.26

The cost of felling and stacking the wood and obtaining and taking care of the bark is given by the Government as follows:

FOR WOOD.

Years.	To fellers and stackers.		For implements.		To support of wood-cutters injured by accident.		Total.	
	Marks.	*Dollars.*	*Marks.*	*Dolls.*	*Marks.*	*Dolls.*	*Marks.*	*Dolls.*
1880–'81	459,162	109,280	1,907	454	912	217	461,981	109,951
1881–'82	468,995	111,621	*3,304	786	798	190	473,098	112,597
1882–'83	445,864	106,115	487	116	588	140	446,939	106,371
1883–'84	478,094	113,786	788	187	996	237	479,878	114,210
1884–'85	477,658	113,683	884	210	†622	148	480,274	114,305

FOR BARK.

Years.	For stripping.		For implements.		For aid to rangers.		For watching bark.		Total.	
	Marks.	*Dolls.*	*Marks.*	*Dolls.*	*Marks.*	*Dolls.*	*Marks.*	*Dolls.*	*Marks.*	*Dolls.*
1880–'81	41,155	9,795	65	15	1,018	242	70	17	42,310	10,069
1881–'82	52,417	12,475	31	7	1,077	257	316	75	53,842	12,814
1882–'83	40,576	9,657	43	10	856	204	517	123	41,992	9,994
1883–'84	47,984	11,420	88	21	1,275	303	382	91	49,729	11,835
1884–'85	36,239	8,625	89	21	1,131	269	390	93	37,850	9,008

* Fellers have, as a rule, to provide their own implements, but in exceptional cases axes, saws, and the like, are furnished by the Government, as, for instance, when it is desired to introduce new and improved tools. The comparatively large amount expended in 1881–'82 for implements was for machines for use in felling, preventive of accidents.

† Then, in addition to this sum, 1,110 marks ($264) was contributed in 1885 to sick fund.

The net receipts of the Government are stated to have been as follows:

Years.	Forest area.	Receipts for wood.		Cost of felling and stacking.		Net receipts.		Net receipt per hectare.	
	*Hectares.**	*Marks.*	*Dollars.*	*Marks.*	*Dollars.*	*Marks.*	*Dollars.*	*Mks.*	*Dols.*
1880–81	65,545.43	2,151,249.42	511,997.36	509,410.68	121,239.74	1,641,838.74	390,757.62	25.05	5.96
1881–82	65,541.04	2,172,141.89	516,969.76	529,297.44	125,972.79	1,642,844.45	390,996.98	25.07	6.01
1882–83	65,508.96	2,332,824.09	555,212.13	489,251.30	116,441.81	1,843,572.79	438,770.32	28.14	6.69
1883–84	65,496.84	2,378,639.16	566,116.12	529,926.97	126,122.61	1,848,712.19	439,993.51	28.23	6.71
1884–85	65,521.05	2,357,152.35	561,002.26	518,170.17	123,324.50	1,838,982.18	437,677.76	28.07	6.68

* Hectare = 2.4711 acres.

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The net receipts per cubic meter have been reckoned out as follows:

Years.	Building wood and timber.								
	Product, including bark.	Receipts.		Costs of felling, etc.		Net receipts.			
						Total.		Per cubic meter.	
	Cu. met.	*Marks.*	*Dollars.*	*Marks.*	*Dollars.*	*Marks.*	*Dollars.*	*Marks.*	*Dollars.*
1880–'81	46,536	760,911	181,097	93,244	22,192	667,667	158,904	14.35	3.41
1881–'82	50,952	850,981	202,521	109,688	26,105	741,243	176,416	14.55	3.46
1882–'83	69,968	925,618	220,297	108,427	25,805	817,191	194,491	11.68	2.78
1883–'84	62,334	906,066	215,643	115,470	27,482	790,595	188,161	12.68	3.01
1884–'85	58,064	857,625	204,114	100,333	23,879	757,292	180,235	13.04	3.10

Years.	Fire-wood.								
	Product.	Receipts.		Costs of felling, etc.		Net receipts.			
						Total.		Per cubic meter.	
	Cu. met.	*Marks.*	*Dollars.*	*Marks.*	*Dollars.*	*Marks.*	*Dollars.*	*Marks.*	*Dollars.*
1880–'81	283,498	1,390,326	330,897	419,792	99,910	970,534	230,987	3.42	.81
1881–'82	285,071	1,321,210	314,448	419,980	99,955	901,229	214,493	3.16	.75
1882–'83	260,295	1,407,205	334,915	358,663	85,362	1,048,542	249 553	4.03	.96
1883–'84	282,129	1,472,572	350,472	414,449	98,638	1,058,123	251,834	3.75	.89
1884–'85	288,320	1,499,526	356,887	417,880	99,444	1,081,696	257,443	3.82	.91

Years.	Building and fire wood together.				
	Product.	Net receipts.			
		Total.		Per cubic meter.	
	Cu. met.	*Marks.*	*Dollars.*	*Marks.*	*Dollars.*
1880–'81	330,035	1,641,888	390,757	4.97	1.18
1881–'82	336,023	1,642,844	390,996	4.89	1.16
1882–'83	330,263	1,843,541	438,762	5.58	1.32
1883–'84	344,464	1,848,712	439 995	5.37	1.27
1884–'85	341,385	1,838,982	437,678	5.39	1.28

The costs of culture are said to have been as follows:

Years.	Total amount of forest land.	Natural renewal.*					In full cultivation.				
		Area.	Cost.				Area.	Cost.			
			Total.		Per hectare.			Total.		Per hectare.	
	Hectares.	*Hectares.*	*Marks.*	*Dolls.*	*Marks.*	*Dolls.*	*Hectares.*	*Marks.*	*Dolls.*	*Marks.*	*Dolls.*
1880–'81	65,563	275.29	154.82	36.84	0.56	0.13	343.88	16,279	3,874	47.34	11.26
1881–'82	65,532	302.16	2,375.96	565.47	7.86	1.87	319.42	17,591	4,186	55.07	13.10
1882–'83	65,500	743.66	2,474.27	579.81	3.33	.79	379.81	17,766	4,228	46.77	11.13
1883–'84	65,488	333.72	61.04	14.52	0.18	.04	278.87	13,875	3,302	49.73	11.83
1884–'85	65,519	425.18	1,916.19	456.46	4.51	1.07	199.63	9,777	2,227	48.99	11.66

* Where young plants spring up from the seed that falls from the old trees.

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Years.	Improvements.*			Nurseries and seed-beds.		Ditches for closure and drainage.†		Purchase and maintenance of implements.	
	Area.	Cost.				Length.	Cost.		
		Total.	Per hectare.						
	Hectares.	*Mks.*	*Dolls.*	*Mks.*	*Dolls.*	*Meters.*	*Mks.*	*Dolls.*	*Mks.*	*Dolls.*
1880–'81	807.02	35,101	8,354	43.50	10.35	19,577	4,659	83,242	5,725	1,362	290.18	69.06
1881–'82	1,021.43	43,873	10,441	42.95	10.22	28,550	6,794	78,005	5,345	1,272	536.63	127.71
1882–'83	1,516.10	37,920	9,025	25.01	5.95	20,665	4,918	53,059	3,466	825	332.46	79.11
1883–'84	1,306.89	40,797	9,705	31.21	7.42	25,223	6,005	57,399	4,337	1,032	491.15	116.89
1884–'85	1,399.61	41,840	9,958	29.89	7.11	23,054	5,487	35,081	2,732	493	351.66	83.69

Years.	Other expenditures.		Total expenditures.			Material.				Bare tracts.	
			Total.		Per hectare.	Seed.		Trees.		Beginning of the year.	End of the year.
						Foliaceous trees.	Coniferous.	Foliaceous.	Coniferous.		
	Mks.	*Dolls.*	*Mks.*	*Dolls.*	*Mks.*	*Kilos.*	*Kilos.*	*100 plants.*	*100 plants.*	*Hectares.*	*Hectares.*
1880–'81	7,802	1,857	84,931	20,213	1.80	0.31	47,737	2,725	50,859.44	40,806.85	260.60	249.35
1881–'82	9,597	2,284	107,869	25,673	1.65	.39	43,696	3,126	38,475.2	62,941.85	129.32	122.13
1882–'83	9,143	2,176	91,768	21,840	1.40	.33	69,668	1,688	28,359.23	50,648.3	95.70	87.48
1883–'84	12,388	2,948	97,185	23,130	1.48	.35	85,809	1,799	41,532.82	63,074.35	87.48	82.48
1884–'85	8,709	2,072	88,382	21,035	1.35	.32	64,058	1,650	47,377.7	45,150.5	81.86	66.15

* By this is meant the filling up of gaps where trees are already growing.
† Exclusive of those used as boundary lines or to preserve roadways.

Roads and bridges required the following average outlays per annum during the years 1881 to 1885: For byways, 30,772 marks ($7,323); for preservation of ways and bridges, 64,524 marks ($13,356), or $20,356 a year for both items.

The compensation paid to keepers, rangers, and chief foresters is given in the paragraphs relating to them to be found above.

The net profits of the forests, it is to be observed, can not be given, because the rangers in charge of them have also farm land belonging to the Government and the forests of communes and corporations to attend to, towards whose maintenance the communes and corporations insufficiently contribute. Similar is it with the supervision exercised by the chief foresters and by the forest bureau at Darmstadt. No reimbursement is made for the amounts expended in this way, and the accounts can not be kept separately. It is therefore impossible to say just what the profits are in the Government forests.

V.—Forest Planting and Culture; Methods; Bounties; Schools, their Organization and Course of Study.

The estimates and plans of operations for each year are gotten up annually by the rangers and presented to the chief foresters, who examine them in the course of the summer in the presence of the rangers, to which examination the burgomaster concerned is also invited in the case of communal forests. In like manner are the estimates and plans of the previous year gone over and compared with the results, the latter being indicated in red ink in appropriate places left free for the purpose. Have the chief foresters no objections to

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raise they declare themselves satisfied, but if the chief foresters and the rangers disagree as to the course to be pursued the subject is laid before the forest bureau at Darmstadt for decision. It is likewise so in comparing the results of a complete year with the estimates and plans made for it. When a revision of these estimates and plans has taken place a report has to be made to the forest bureau at Darmstadt as to what is proposed to be done the next year for approval, and the projects must be carried out as approved, and no single one left undone or amended without an approval in writing from Darmstadt. It hence follows as a rule that no undertaking is to be commenced until two experts (ordinarily rangers and chief foresters) are agreed as to the same, and have assumed the responsibility therefor. This is considered to be the greatest safeguard that can be raised in the interest of the state in the administration of the governmental and communal forests against the commission of serious blunders.

The forests are kept up partly in the natural way by the fall of seed from the older trees, and young growth, and partly artificially by the sowing of seed and planting of young trees.

The tables showing the costs of forest cultivation during the years 1880–'81 to 1884–'85 set forth the amount of new growth by natural means during these years, as well as the quantity of seed and stock used for repleting the forests. The Hessian Government informs me, in treating of this matter, that the areas devoted to seed and young trees were pretty much the same in each case; that is, as I understand it, as much devoted to seed as to young trees.

The rules or methods of cultivation in the different parts of the duchy are said to be as follows:

PROVINCE OF STARKENBURG.

This province can best be designated as the district lying between the Rhine, Main, and Neckar, by which rivers it is almost completely encircled. The valley of the Rhine forms the western part of the province, to which the valley of the Main is adjoined on the north, while to the east of the former of these valleys, and in a southerly direction from the latter, runs the Odenwald. This Odenwald is a wooded mountain district between Darmstadt and Heidelberg, with a length of about 40 miles and a breadth of from 24 to 30. Its highest points are 1,959, 1,869, 1,834, 1,679, and 1,624 feet high, respectively. More than one-half of Starkenburg is of a flat character, consisting for the most part of a sandy soil, which, towards the Odenwald, seems to be much mixed with the remains of rocks of a primitive and volcanic origin, by which its productive capacity is materially raised. Small scattered tracts of clay, clay-marl, loam, and turf also appear, which are highly fertile. In its most northerly part, in its foreparts, and throughout the valley of the Gesprenz, a small stream, the Odenwald exhibits an exceedingly rich, loamy soil; in its western part, so far as it can be used for agricultural purposes, it possesses chiefly a loamy to clayey soil, while in its entire eastern and southeastern parts a commoner loamy soil of variegated sandstone prevails.

The area of Starkenburg given over to forest cultivation is said to be 42.01 per cent. of the whole area of the province. In proportion to population it is .32 hectares (.79 acres) of forest to each person. For the convenience of consideration, in looking at it from a forest point of view, it is divided into three parts, which I shall take up seriatim.

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(1) The valleys on the right bank of the Rhine and the left bank of the Main, commonly known as the valley of the Rhine, the valley of the Main, and the Rhine-Main Valley.

Here we have altogether 53,000 hectares (130,968 acres) of forest land. The country is chiefly of a tertiary formation. The upper strata are composed almost entirely of sand, mingled here and there with masses of stone. Below the sand lies, at shifting depths, an impenetrable layer of earth, upon which the underground water rests; but this water never causes swampy ground, and is therefore considered to be always in motion towards the Rhine and Main. Sometimes, however, in very rainy years, this water appears upon the surface of the ground in the forests quite extensively. The soil is loose, moist, and deep, on the whole, and is therefore excellently adapted to the cultivation of forest trees. But the moist, sandy soil is so favorable to the growth of weeds, in particular to close turf, that young wood has a desperate struggle for existence. Late frosts, too, are of frequent occurrence and very damaging. The close turf has a good deal to do with causing them, as it lowers the temperature by warm exhalations. This has been established by observation. It is often noticed that young stock standing in close turf will be frozen black after a late frost, while similar growth near by, growing free of this turf, will show no sign of injury from frost. In summer, also, the vegetation suffers from dryness in hot seasons. Knowing thus the peculiarities of the soil, the wise foresters plant pines where the dry sand rules, oaks in the moist ground, and alders where the tendency is to marsh, while the sensitive beeches, responsive to the frost's touch, are placed back among the foliaceous trees for protection.

This first part of Starkenburg, of which we are now treating, is subdivided into four others, namely:

(*a*) *High dry situations.*

In these, pines render excellent returns. At present there are about 33,000 hectares (81,546 acres) of them. They, however, do not do so well as in North Germany or Upper Hesse. The present stock of trees is partly of pure natural growth and partly produced by the sowing of seeds, planting of trees, etc. The young trees which spring up in a natural way need a good deal of attention and help, as they develop unequally. The best success is met with in the planting of yearlings. The ill luck encountered in North Germany in planting pines one year old, especially the abnormal formation of the roots of the trees twisting up and pressing against one another, is said to be due not to the planting of the trees at this age, but to the manner in which it is done. To insure these young trees a good growth on being transplanted when they are a year old, three conditions, it is claimed, must be observed; there must be good material to plant, good soil in which to place, and careful setting of the trees in the ground. By good material are by no means the strong saplings to be understood, with top roots 30 centimeters long, looking like maiden hair, but those with heads the size of a walnut and perpendicular roots 10 to 12 centimeters long, with short growths of stiff, bristle-like side roots. The stronger and greater the growth the more difficult is it to set the roots properly in the ground. Saplings should, therefore, not be raised in strong soil of light character to a great depth. The soil where they are to be cultivated should be plowed

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up a foot in depth, and the roots placed in the right position. The nurslings are to be planted pretty thick together, 30 centimeters apart in rows, the distance between the rows at the utmost 1.25 meters, in order to provide against too strong a growth of limbs.

If the planting of yearlings is done in this wise, and they be carefully protected from the air while being transported from their cosy beds to their new places of abode with moss or humid earth, there will be success in their rearing. On strong soil, where the grass grows freely, it is thought advisable to plant pines on completely worked land in rows with potatoes for one to three years, and on poor soil on strips plowed up for 25 centimeters wide and the same distance in depth, which shall be 125 centimeters apart.

The cultivation of red beeches under pines is done more and more. If it is done early the beech, even upon ground of poor quality, does not refuse to grow. Under the leaves thrown off by the beeches the moss on the ground disappears and gives place to a covering of leaves, conserving moisture, the danger from fire and insects is lessened, and the forester gets stronger pine to fell.

Wherever young growth is springing up for renewal of the forest there should be a corresponding number of old trees equally distributed over the places where there has been felling.

(*b*) *Localities of fresh soil.*

Here, up to the beginning of the present century, grew chiefly the lordly oak, on extensive forest tracts, at the same time given over to pasture, upon which large droves of cattle and splendid herds of swine were driven, to pasture and gather up the fattening acorns. Pasturage was the chief object had in view, while the growth of forests was of secondary consideration. Little wood required a small population, and little was taken. Changes in the mode of farming made pasturage in forests dispensable; the new age, brought with it large demands for wood; particularly did the clamorous locomotive, snorting its way through the cherished possessions of the past, call loudly for the old oak's fall, and rapidly succumbed this ancient denizen of the forest, until little was left of the rich old oak forests of the past; and so is it still. When the monarch was almost wholly gone, men sought to restore him, but with little success. The acorns spring readily into little trees and give tokens of a rich growth, but the saplings cannot long endure the shade of the parent trees, and they must be liberally trimmed that the young growth may receive light and air, but the more they are torn asunder to give entrance to the vivifying light, the more grow the rank things of nature, and combat vigorously with the tender young oaks for existence. Then comes the fateful late frost as a sort of confederate to the noxious in nature, and together they make rueful work.

The grove soon makes a sorrowful appearance. Here and there small bodies of trees are to be seen, while wide tracts of bare ground show where many more were and are not. Such is the result which meets the attempt to rebuild old oak forests by natural means. The best way to save groves of young oaks ruined by the frost is said to be by clearing out the old trees and plentifully planting pines among them. The long-striding pine soon protects the young oaks from the frost, and destroys the baneful grass, while their scraggy tops permit the light to stream through in sufficient measure to nourish the young oaks, which soon give evidence of the beneficial effects of the

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new companionship. Long and sad experience has taught the foresters of Hesse that the pine is indispensable in the cultivation of oak in their land. They are most effective when seasonably planted and put uniformly, and not too far apart, among the oaks.

More satisfactory than the renewal of oak forest by natural means is what is known as the kahlhiebsbetrieb (the ground after being bared of trees being resown or replanted.) In this way only can all the conditions be given which the nature of the oak requires. The oak is thereby forced to send long and strong roots deep into the earth, and the soil is deeply worked with this object in view. The oak requires for years a space free of all weeds, etc., and a good share of moisture, and a soft soil kept well cleared of weeds is therefore very necessary. It sucks in the air's moisture and the dew more readily than hard ground, and keeps life in the young trees. To keep tracts of land devoted to tree culture free from all noxious growth for years is expensive, and it is therefore recommended that agricultural products be grown between the rows of trees, in whose cultivation the grass, etc., will be kept down, and a return be received for the labor expended.

Of great importance is the determination of the question whether the oak ought to be sown or planted. For various reasons the sowing of the seed should be preferred to planting. To thrive well the oak must have perpendicular roots of good strength sown in the moist underground, to serve as a support for the high, spare trunk which shoots up.

This condition can not very well be provided in the case of planting. Seed, too, has another advantage, that it can be made to spring up in rows and at whatever distance apart is desired, so that the young trees can be made to protect one another and their branches be directed outwards, thus destroying the growth of grass on both sides. But, whether seed is sown or planting done, the oak should never be cultivated alone, but in conjunction with the pine upon loose soil, free from all rank growth; pines one year old should be preferred to everything else. It is doubtful in what degree the pine should be intermingled with the oak, but it is thought the pine will fulfill its end when cultivated in alternate rows with the oak, thus affording the latter protection on both sides. If the rows run from east to west the protection is relatively the greatest, because the compact pines in the early part of the year will guard the oaks from the sun and retard their vegetation, and the rows thus disposed grant access to the cool east wind. The latter is quite an important point to be considered, as frosts of late occurrence are said to form chiefly when this wind blows and to be least observed where it has free play.

Very useful to the oak can the pine be in its infantile years, but very damaging later on. Fast grows the pine in Hesse, and in time suffocates the oak if not checked, particularly where growing in irregularly among the oaks and not in rows. So soon as the tops of the pines come together they must be carefully thinned, but not too liberally lopped off, as the oak still is in need of protection from its lank companion. It is only light that must be procured for the oaks at first, but as they grow in size and increase in strength the pines can be gradually removed altogether.

Where an oak grove has been decimated by frost it is said that it is not well to cut down the plants that have been injured, as the office of freeing itself of its stricken members will be cheapest and best performed by the oak itself, for so soon as the protective pines are in-

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troduced the young oaks send out a new growth, which will, as a rule, be a single shoot which will rapidly grow, while if they are cut down a number of shoots will break out, and the strength of the little trunk be impaired.

As soon as light is provided an undergrowth must be provided for, for which the red beech is generally best adapted; but for a soil moist to a considerable depth the yoke-elm is preferred, or something of the kind. This undergrowth is best produced by planting, as the young shoots springing from seed are too sensitive to frost. After this planting of undergrowth is accomplished what remains of oak should be frequently thinned, that the young oaks may be excited by the entrance of plenty of light to strong growth and the trees under them be likewise benefited; but great care is to be exercised in this thinning-out process so long as the oaks have not finished their top-growth, lest they be made to expend their force in breadth, by throwing out strong limbs and double tops.

In the valley of the Main and the Rhine the oak at present occupies only some 8,700 hectars (21,498 acres) of forest land, while it is certain that it could and ought to embrace a much larger area, and in past times did undoubtedly do so. The pine, with the help of man, has pressed the oak into the background, because thought easier to raise, and presumably more profitable; but experience, where they have been grown side by side, says that it is a false assumption.

Where it is possible, the oak should be grown alone, and when grown side by side with other trees the pine should be its companion in dry situations and the ash in moist. The beech does not answer, because it is more sensitive to the frost than the oak, and its wood less valuable, but makes a good undergrowth after oaks and pines have got a good start.

(*c*) *Situations of a wet or marshy character.*

Here and there are to be found spacious but mostly not very extensive patches of turfy, marshy ground, from which the humidity hardly ever entirely disappears, even in the height of summer. On such land the black alder is principally used, mixed, more or less, with ashes and oaks. Their seed is sown in the fall of the year upon hot-beds, which are securely closed, and seasonably covered early in the spring with brushwood. Then they are afterward set in the ground where desired. When the pieces of marshy ground in oak forests are not of sufficient size to form subdivisions it is advisable to grow alders with the oaks. The alders up to their sixtieth year will give very valuable returns, while the oaks from then on will form stronger tops. It is also recommended that the alders, because of their service to the oaks as a protector, be not confined to the marshy ground, but extended to the less wet soil. The part of nurse or guardian which the pine performs for the oak on dry ground is rendered by the alder on wet.

(*d*) *The tracts exposed to flooding from the rivers.*

There are about 500 hectares (1,235 acres) of this. Here the high wood consists of oaks, ashes, alders, poplars, and wild-apple trees, beneath which grows a thick, impenetrable mass of bushes of various kinds, with every open space filled with a luxuriant growth of weeds and grasses. The wood grows splendidly, and the oaks give a mag-

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nificent yield of acorns for seed, in some years so plentifully that the requirements of all the governmental forests can be supplied.

(2) That part of the Odenwald, of a primitive rock formation, the so-called Bergstrasse.

This comprehends that part of the Odenwald which lies pretty nearly northwest of a line drawn from Heidelberg to Aschaffenberg, and fills up the triangular space lying between the towns of Darmstadt, Heidelberg, and Aschaffenberg. Syenite and white-stone are the chief stones. Of granite there is less. Gneiss prevails in the east. The rocks on the surface of the ground have almost all decayed under the action of the weather. Only a few sterile, stony patches remain. The soil is productive, the climate mild, and forest trees grow luxuriantly up to the summits of the mountains, the highest peaks of which are the Neunkircher Höhe, 1,935 feet high; the Tromm, 1,817 feet, and the Felsberg and Melibocus, 1,707 feet high.

All kinds of wood thrive here. The beech has all along predominated, but must give place more to timber-producing trees. Where the soil and situation permit of it different kinds of trees will be cultivated together; in the vales with fine fertile soil the oak with the red beech as an undergrowth, on the hills with fine deep soil the larch with the silver fir underneath, in places with a good and deep but dry soil the pine with the beech below. Where the soil does not favor long-trunked trees purely there should be forests of mixed character, it is said. Oaks, ashes, maples, alders, chestnuts, larches, firs, and pines should be mixed, according to requirements, with red beeches obtained by natural springing up, and the foliaceous trees should always get a good start of the coniferous. Where the land is free of stone agricultural products can be cultivated among the trees.

On steep slopes care is directed to be taken to catch the hurrying water in horizontal gulleys and divert it into dry parts, and thus get it evenly distributed, as far as possible, over the whole surface of the ground.

Adjoined to that part of the Odenwald we have just been considering is a tongue of mountainous land, lying eastward of Darmstadt, about 10 kilograms long and 30 wide, belonging to the dyas formation. There is about 5,000 hectares (12,355 acres) of it. The soil is principally a fertile, moist, heavy loam, upon which all the kinds of wood just considered grow well, and which is to be cultivated like the land last treated of.

(3) That part of the Odenwald belonging to the colored sandstone region.

The southerly and easterly part of the Odenwald, lying between a line drawn from Heidelberg to Aschaffenberg and the duchy's frontier, is here meant, embracing about 42,000 hectares (107,786 acres) of forest land. The climate is not so mild as the Bergstrasse, which we considered under No. 2, but is temperate, and the soil is far less productive.

The southern declivities of the mountains present excellent fields for the cultivation of the oak for bark. The quality of the bark obtained here from trees allowed to grow for thirteen to sixteen years is said to be unexcelled. They are trying now to raise a tree which in the best localities, upon fifteen years' growth, will give up to 8,000 kilograms (17,600 pounds) of bark a hectare (2½ acres). When the bark and wood have been removed the saplings, etc., are burnt with fire and their ashes hoed into the soil, and the ground between the

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old stumps planted with winter grain or buckwheat. This sort of thing is regarded as objectionable, but it has the force of ancient custom and is done on a large scale. Nevertheless it is thought it will be gradually given up in time.

Where forests of this kind get run down they can be improved by the introduction of pines. The pines are cultivated by sowing their seed in furrows or by planting yearlings. They are allowed to stand until the heath has disappeared and the soil has become better, when they are hewed down with the felling of the cropped oaks.

The northern declivities, as well as the higher and rawer situations in this district, are used for high trees. Upon the northerly slopes, and in the cooler localities, the red beech is largely grown; in the drier and southerly parts principally pines, but also oaks and firs. The forests in this district are chiefly in the hands of private individuals, the State possessing only 5 per cent. of the whole. It were much better, it is said, if they belonged to a greater degree to the state.

PROVINCE OF RHINE-HESSE.

This province is poor in forests. Only 4.66 per cent. of the whole area is devoted to forest cultivation, or only 0.02 hectares (0.04 acres) to each person of the population. This is the most fertile of the three provinces of the duchy, and the smallest in size, comprising about 533 square miles (English), while Starkenburg has about 1,171 and Upper Hesse about 1,275. It is of a hilly nature, and is bounded on the north and east by the Rhine.

PROVINCE OF UPPER HESSE.

Of the whole area of this province 32.50 per cent. is given over to the cultivation of forest trees, or 0.40 hectares (0.98 acres) per capita of the population. It lies north of the Main and is a difficult region to describe physically. It is situated high above the sea, and has no large plains. It is in part of an undulating character, and partly of a rough, unfertile, mountainous nature. The eastern and western divisions of the province are wholly unlike the soil of the western portion being very fertile, while that of the eastern is very poor. For convenience of consideration we will divide it into—

(1) *The basalt section.*

The Vogelsberg Mountains, the most important basalt group in Europe, rise in the eastern part of the province of Upper Hesse into an elevated plateau about 9 miles long and 5½ miles broad and up to 2,536 feet above the level of the sea, from which pretty radial, wide, flattened spurs jut out, with fertile valleys inclosed between them. The dark soil produced by the decayed basalt is very strong, but heavy and cold. The chief range is incompletely covered with forest trees. Its southern half lies bare of trees. Also on the fore mountains numerous tracts bear only short grass and wild bushes, and where there are such parcels of some extent they give the landscape a desolate, dreary appearance. Were they cultivated with forest trees a beneficial effect would be exerted upon climate and inhabitants.

This basalt district is divided into two regions;

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(*a*) *The high situations.*

Where the climate is raw and moist, and where the number of rainy and foggy days exceed those upon which no moisture falls, the beech is at present the prevailing species of tree grown, to which the mountain maple is associated. Where the beech does not spring up well spontaneously, the fir is introduced. Such insertions of firs are said to often comprise many acres of land. In the forests in the higher regions the humidity of the climate gives the vegetation a peculiar look, with branches scarred by the vapor and ice and covered with lichens.

The spontaneous growth of beeches is surrounded with difficulty. Years yielding mast are rare, as the seed does not fully ripen in the cool summers, and the half-molded layers of leaves do not allow the sapling to strike its roots down into the mineral soil, while upon tracts where the light dwells raspberry bushes, ferns, and grasses claim the soil and choke out the weaker beeches, maples, and firs. The mountain maple seems to do the best.

Next in importance comes the pine, but experiments so far made with the fir have secured for it the favor of the cultivator only in a moderate degree, as it suffers so from the effects of ice and vapor that few specimens of it fifty years old are to be met with whose tops still serenely rear their lofty heads, but it is said that they are nevertheless more profitable than beeches, and it is thought they are raised too thick together. Where there are gaps between young maples and young firs they should be closed up, it is said, with beeches, by sowing the seed or planting.

Experience has taught that in this region firs when forty years old should be exchanged for beeches, whose seed is to be sown under them, as the beech can thrive in this moist climate with a closed roof of firs above it.

(*b*) *The fore mountains.*

Of this there are about 54,000 hectares (133,439 acres). In this region the beech is decidedly the prevailing kind of tree, and between the beech forests detachments of pines start up, as well as clusters of firs. Parcels of oaks are to be met with, but are on the whole of slight extent, of which the same may be said of larches, ashes, alders, maples; white firs and elms are still less grown, but the yoke-elm appears in the deeper and moister situations, while the birch and the aspen show themselves in all tracts.

The beech has grown here since ancient times, the mistress of the forest, and thrives much better than any other kind of tree. Attempts in recent times have been made to introduce other trees, such as oaks, ashes, and maples, among the beeches, but mostly in vain, and more success was met with in the case of firs, pines, and larches. It is recommended, however, that forests of mixed trees be striven for.

(2) *The district of colored sandstone surrounding the basalt region on the north, south, and east.*

The basaltic region is enriched in the northern, southern, and eastern part of the province of Upper Hesse by one composed of colored sandstone. This latter takes in about 23,000 hectares (56,835 acres). Here the pine is the leading kind of wood. On the moist mountain

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sides grow pretty good forests of oaks. Pines are now more and more grown by the transplanting of yearlings. Formerly it was chiefly done with seed.

(3) *The lowlands at the foot of the Vogelsberg.*

Around the basaltic branches of the Vogelsberg there lies a band of clayey, loamy, chalky, and sandy deposits of Tertiary and Devonian character, embracing about 10,000 hectares (25,000 acres) of forest trees. The soil being varied in quality, in consequence of differences in the nature of the deposits, the vegetation is various. While in one locality beeches growing on a loamy soil are perhaps the most flourishing and best developed the duchy anywhere has to present, in another, where the soil is a cold, plastic clay, a sorry growth is beheld. In the dry sand and gravel the pine is held here to be the fittest tree; in moist soil, the oak; with beeches for an undergrowth in each case. On loamy soil a mixed forest, with beeches for a basis, is thought best, and a good insertion of oaks. Where the ground is clayey no tree does well, but the most satisfaction is got out of the oak, mixed in its youth with the alder, which then serves the oak as a guard.

(4) *That part of the Taunus Mountains belonging to Upper Hesse.*

On the eastern side of the Taunus range lie about 9,000 hectares (22,000 acres) of forest trees. The country is Devonian in character principally, geologically considered, and the soil varied in quality.

In those forests where trees are grown for bark they are allowed to grow for eighteen to twenty-four years, and several years before the forests are completely cleared they are liberally thinned out, which is said not only to greatly improve the quality of the bark on the remaining trees but to considerably increase their growth in new wood. High prices paid in past times for bark led to a great deal of land being devoted to the cultivation of cropped trees for bark, upon which present low prices are exerting an unfavorable influence.

In the regular forests is a mixture of trees preferred, with the oak predominating in moist situations and the larch and pine in the dry.

CLIMATE.

The Rhine-Main Valley in Starkenburg is, in general, to be described as a strip of land with a mild south German climate, which, in consequence of the influence of the Odenwald, the rivers Rhine and Main, and the great number of its forest trees, is very much subject to storms and fogs. That part of the plain which is free of forest trees, lying between the Rhine and the Bergstrasse, suffers from dryness in summer because the vapors and storms, after passing the Rhine, rush with precipitation to Bergstrasse. The Odenwald has, with few exceptions, a very nice, mild, mountain climate. In its western part, known as the Bergstrasse, the grape and almond flourish. Upper Hesse has a more northerly climate and the Vogelsberg is raw. Rhine Hesse, poor in water and almost devoid of forest trees, is a warm vineland, whose soil and atmosphere become very warm in summer during the day and cool off quickly at night. Certain heights and plateaus suffer from wind. Meteorological observations made by certain gentlemen at six different places in Hesse during the

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years 1866 to 1879—that is for fourteen years—showed the following average results:

The highest average temperature was at Darmstadt, in Starkenburg, + 8.005° Réaumur for the year, + 1.31° in winter, + 7.79° in spring, + 15° in summer, and + 7.92° in autumn, and the lowest at Giessen, in Upper Hesse, + 6.840° Réaumur for the year, + 0.28° in winter, + 6.62° in spring, + 13.50° in summer, and + 6.88° in autumn. The largest average amount of rainfall per annum was at Michelstadt, in Starkenburg, 84.75 cubic centimeters for the year, 17.80 cubic centimeters in winter, 18.84 in spring, 25.82 in summer, and 22.29 in autumn, and the lowest at Pfeddersheim, in Rhine-Hesse, 48.58 cubic centimeters for the year, 9.62 cubic centimeters in winter, 9.88 in spring, 17.83 in summer, and 11.25 in autumn. The largest number of rainy days on the average was at Darmstadt, 181.04 per annum, 39.40 in winter, 47.14 in spring, 49.01 in summer, 45.50 in autumn, and the smallest number at Monsheim, in Rhine-Hesse, 137.93 per annum, 27.80 in winter, 35.43 in spring, 39.70 in summer, and 35 in autumn. The largest number of days on which snow fell was at Giessen, 27.28 for the year, 18 in winter, 6.08 in spring, none in summer, and 3.80 in autumn; the smallest number at Monsheim, 19.53 for the year, 11.70 in winter, 4.90 in spring, none in summer, and 2.93 in autumn. State of the barometer, direction of wind, and relative moisture of the air were observed only at Darmstadt.

BOUNTIES.

None were granted, the government of the duchy informs me.

SCHOOLS, THEIR ORGANIZATION AND COURSES OF STUDY.

The study of forest culture is chiefly done at the State University at Giessen, but attendance is also permitted at other educational establishments. The manner in which organized and the courses of study pursued have not been made known to me.

The branches of knowledge with which the forest officials have to be acquainted is set forth under III—Organization and functions of Government forest bureaus.

EXPERIMENTAL FORESTRY.

There is an institute for experimental forestry, the provisions of law affecting which, passed in 1882, are as follows:

The object of the establishment of this institution is the furtherance of forest culture and the obtainment of exact knowledge for the cultivation of forest trees in Hesse according to local requirements and climatic conditions. The means to this end are the making of investigations of a theoretical and practical nature, and a comparison of them with one another, as well as with results met with elsewhere. The institute forms an integral part of the imperial combination of such establishments in Germany, and works in connection with them.* The institute is adjoined to the forest institute belonging to the university at Giessen. The scientific experiments are under the direction of the two professors of forestry at this university. The experiments and investigations take place in and about Giessen as the seat

*The different states have such institutions, which now work in common.

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of the directors thereof, and partly in the leading forest districts of the duchy. They are given an assistant and the co-operation of the forest officials.

VI.—Destruction of Forests.

Causes and results.

The destruction of forests is chiefly brought about by fires. The extent to which this occurs in Hesse is slight, and it seems that during the years 1881 to 1885, both inclusive, there were 272 fires in the woods of the duchy, causing a total damage to the forests of but 10,055 marks ($2,392).

Of other causes of consequence there have been none for a long time.

Bared tracts are put under cultivation as soon as possible.

VII.—Reclamation of Sand Dunes or Waste Places by Tree Planting.

There are no sand dunes unoccupied by wood or waste places of any consequence.

VIII.—Sources of Lumber Supply—Trade in Lumber, etc.

The tables under IV (revenues from Government forests) set forth all the information I have on this subject. A part of this wood is exported, particularly in the cases of beeches and coniferous trees; and on the other hand there is much floated timber imported, the importation exceeding the exportation, on the whole.

IX.

The Hessian Government names the firms of Appel, Lecoq & Keller, of Darmstadt, as reliable dealers in seeds. Of dealers in saplings there are none in the duchy, as the foresters produce all that their needs require.

FINES AND PENALTIES.

The value of all forest objects is fixed by governmental tariffs, according to which fines and penalties are imposed. If the value of the purloined or damaged object is not contained in these tariffs it is estimated by the forest officials. Parents and guardians are responsible for the acts of their minor children and wards, as are all others who have minors under their charge and in their keeping; employers for their employés and apprentices, if the misdemeanor has inured to their benefit; buyers of wood for the acts of those employed by them to fell or prepare wood, so far as these persons are not regular forest woodmen; and communes and individuals for the act of their herdsmen while in their service; but in the three last-mentioned cases the accusation must be brought within four days after the discovery of the misdemeanor. Whoever forces children or others under his authority to commit trespasses in the forests is punishable with imprisonment, or by fine up to $35. The lowest fine imposed for a trespass or misdemeanor in the forests amounts to 7½ cents.

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The penalty imposable for a forest misdemeanor is doubled when the act is committed at night or on a Sunday or Church holiday, or on a day when the forest court of the district is held; when the accused, regardless of the admonition of a forester, has persisted in the act; when the case is one of repeated commissions of trespass on pasture or grass land, or of stealing in the forest (the taking of dry brush-wood being excepted) in any one twenty-four hours; when the stolen things have been sold or otherwise disposed of; when a saw is made use of in obtaining wood; when the culprit has been once before imprisoned for a similar offense; when the author has sought by blacking his face or disguising himself to escape detection; if the accused, on being discovered in the trespass, gives a false name or place of residence, or refuses to state either by keeping silent, the penalty fixed by the tariff and one-half as much again is imposed; so it is also for stealing wood or committing a pasture or a grass trespass, if he has been convicted of a like act at either one of the two immediately preceding forest courts, or has used stolen wood in the trade he follows. An additional penalty amounting to one-fourth of the regular penalty is added to it when the accused, on being seen by a forester committing a trespass, does not stand still when called to by the latter, but rather flees away or gets the better of the forester without having done him any injury by word or deed; when the accused, at the time the misdemeanor or trespass was committed, was employed in the forests in some capacity, as a wood cutter, etc. Whenever several of these provisions are applicable to one case the penalty provided for in each is imposed, with this restriction, that the sum of the penalties shall never exceed four times the amount of the simple penalty fixed for a like transgression. Persons convicted of forest offenses pay the fines fixed for their cases, costs, and damages, and moreover a forfeit, which is set at from 5 to 90 cents.

Whoever, without authority, takes dry standing wood, stump-wood that has been grubbed around, thin boards or chips, brush-wood or limbs of trees lying on the ground, when the same have not been prepared for sale or use, is made as a rule to pay double its value as a penalty, but only its actual value when no tool, wheelbarrow, or vehicle has been employed in its abstraction. Whoever, without right, takes off a green trunk or sapling is made to pay thirty times its value as a penalty when it measures $1\frac{1}{2}$ inches in diameter in its lower parts; twenty-five times its value when it measures from $1\frac{1}{2}$ to $3\frac{1}{2}$ inches; twenty times its value when it measures from $3\frac{1}{2}$ to $4\frac{1}{2}$ inches; fifteen times its value when it measures from $4\frac{1}{2}$ to $6\frac{1}{5}$ inches; ten times its value when it measures from $7\frac{4}{5}$ to $9\frac{2}{5}$ inches; and four times its value when it measures $9\frac{2}{5}$ inches or more. For taking green wood from a nursery, or green wood which has been planted, an additional penalty of $2.15 is added to the foregoing. For taking posts or wood fencing off a piece of ground the penalty is five times the value of the abstracted wood, with $2.15 in addition, and the cost of replacing the stolen objects. All other abstractions of wood not mentioned in this paragraph are atoned for by the payment of a penalty equal to three times the value of the purloined objects.

For bark already peeled off which the accused has appropriated to himself, or which he has torn off from lying wood, or for charcoal or ashes which have been stolen, the penalty that is imposed amounts to five times the value of the appropriated article. Where

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the bark is stripped from growing wood, twenty times its value is exacted. In addition to all these penalties the courts are empowered to add fourteen days in jail in the cases of habitual trespassers, and these habitual trespassers can even get three to four weeks in jail. Stealing is defined to be the putting of wood, which has been lying on the ground, upon a wheelbarrow or other vehicle, upon one's back or shoulder, with thievish intention, or the taking of it in any other manner from its place of rest with similar intent; or the felling of green wood for the purpose of unlawfully carrying it off. Similar is the definition applied to the abstraction of other forest products. If a tree is so injured by a trespass that it dies, or becomes seriously checked in growth in consequence of it, the penalty is imposed for the whole tree. If the stolen thing has been so used that its exact size cannot be ascertained by exact measurement the size is estimated. A person who knowingly buys or accepts products stolen from the forest makes himself *particeps criminis*.

The penalty for stealing the seed of forest trees, or useful bushes, is fixed at three times the value of the seed taken, which is made six times the value of the seed when it is obtained from inclosed ground, or from tracts where seed is growing, or fellings taking place—that is, in the case of oaks and beaches. For improperly taking wild fruit about 45 cents a basket is imposed as a fine, and for stealing cultivated fruit about $2.15 for the same quantity.

The unauthorized pasturing upon uninclosed ground of cattle, swine, horses, asses, or goats, is punished by a fine of 15 cents a head, and for a similar offense with respect to sheep the fine is 7½ cents a head; but the total amount of the fines levied is not to exceed $4.25 in any one case. This is increased twofold when the trespassing is upon an old inclosure, or is done with swine at the time the acorns are falling; and threefold when it is done in a recent inclosure, or on a tract where seed is springing up and there is a young growth, or where there is a felling; but in the first instance, a compound fine is not to go beyond $8.50, and in the second not to overreach $12.15. If the trespassing is done by cattle astray only the actual damage done has to be made good. The exercise of vested rights at improper seasons of the year, and the exceeding of one's privileges in any particular, are regarded as trespasses.

For taking grass from uninclosed ground the fine is 15 cents for each bundle that can be carried on the back or shoulders. For doing the same thing on inclosed parcels the fines for the same quantity are 30 cents when the grass is torn up; the same amount when cut in an old inclosure with a sickle, scythe, or like instrument; 45 cents when done in this way in a new inclosure, and 70 cents when committed in the same manner in a nursery, or where there is young growth or a clearing.

The fine for pulling leaves and other growth from growing foliaceous and coniferous trees is 30 cents a burden. For taking dry leaves, dry cones, moss, broom, and other litter of the kind on uninclosed tracts the fine is 10 cents a burden. Getting litter on forbidden land is punished per burden by a fine of 20 cents when no tool is used, and when a rake, sickle, spade, hoe, or something of the kind is employed the fine is 30 cents in old inclosures and 50 cents in new ones, and where there is a nursery, or young growth, or a clearing.

For carrying off stone, turf, gravel, loam, or other soil, except mold and sods, the fine is 7½ cents for what can be carried on the

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person, 15 cents for what a wheelbarrow holds, 30 cents for what is contained in a two-wheeled vehicle, and 60 cents for what is in a four-wheeled one, with the fine one and a half times as great when the trespass is committed in inclosed ground where there are trees more than forty years old, and twice as much when it occurs among younger trees. Whoever without authority takes earth, stone, or sods from public or private ways or on land belonging to others, digs up earth, loam, sand, gravel, or marl, or cuts out turf or peat, sodding, or stones, the right to do which does not require a concession or permission from official authority, can be fined up to $35 or punished with imprisonment. And the law of Hesse prescribes the same penalty for the obstruction of all similar objects. For unlawfully procuring mold or sods from the surface of forest ground the fine is the same as in the case of litter. The stealing of cut stone is treated as common thieving.

The stealing of rosin, cones, or the juice of the birch or maple from the trees is accompanied by a fine of 45 cents for each tree injured, provided no permanent injury is done. Whoever destroys wood lying on the ground or wood still standing, but in a dry state, or so injures it that its value is diminished, has to pay a fine equal to the value of the injury. Whoever intentionally injures trees, stones, or other objects marking boundaries has to make the thing good and pay $4.25 as a fine. When it is shown to have happened accidentally, the thing injured has to be restored and $2.15 paid as a fine. In the case of injuring hedges, or other things inclosing grounds, signboards, and the like, what is injured has to be restored, and a fine of $4.15 paid when done intentionally, or 45 cents when accidentally. For going unlawfully on strange forest ground and digging or plowing up the same, or making use of it in a similar manner as though one's own possession, the fine runs from 85 cents to $17.15. If, in addition, any structure or building is put up, $2.15 is added to this fine.

The authors of forest fires are turned over to the courts of law for punishment.

Workmen employed in the forests are fined as follows for negligence or misdemeanor while at their work:

For felling the wrong wood, one-half of its value.

For failing to fell wood designated, the loss of wages for the felling;

For improperly felling or cutting wood with an ax instead of sawing it with a saw, 22½ cents for each trunk and 7½ cents for each log;

For felling a tree in such a way that it injures valuable undergrowth or side growth, 22½ cents;

For neglecting to dig out wood, when prescribed, whose lower parts could be used for building timber or in the arts, 22½ cents for each trunk, and for the same offense in respect to fire-wood 7½ cents for each trunk;

For not properly sawing off wood close to the roots and for making logs too long, 22½ cents for each trunk, and for doing the latter in the case of fire-wood 7½ cents for each trunk;

In forests of topped growth, for splitting a trunk, or not cleanly cutting it off, or in taking bark from the trees, not properly doing it, 5 cents for each tree;

For not sowing seed or making plantings evenly or according to agreement, 5 cents for each spot;

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For converting wood of the oak, maple, ash, or elm, that could be used for building timber or in the useful arts, into fire-wood, the value of the wood, and the same rule applies to other kinds of wood when converted into fire-wood contrary to directions;

For cutting off logs, sticks, or faggots, contrary to directions, into improper lengths, or improperly splitting logs, or binding too few or too many faggots together, or converting logs into sticks, or sticks into faggots, in an unauthorized manner, 2½ cents for each piece or stick;

For not assorting building wood according to directions, 2½ cents for each piece;

For not carrying wood to the places designated, 7½ cents for each solid cubic meter or every fifty faggots, and ¾ cents for each piece of building wood;

For not providing wood with supports when put on places where there is vegetation, 5 cents for each cubic meter;

For reversing the length and breadth in piling wood, or heighth and breadth, 7½ cents for each layer;

For improperly piling up or placing wood in layers contrary to directions, twice the amount of the difference in worth;

For giving piles of wood different surface dimensions to those specified, three times the value of the difference in worth;

For using logs for meter supports contrary to instructions or when not absolutely necessary, 5 cents for each support;

For neglecting to cleanly do a felling or piece of work, the cost of the unfinished work;

For every other violation of instructions of the forest officials not above provided for, 7½ cents.

In all the above cases if the act committed or omitted admits of rectification or amendment the offender has to pay for the doing of it, if he does not make the rectification or amendment himself.

The charcoal burners, when they erect their charcoal kilns on the wrong spots, are fined $1.30. When they procure leaves, grass, and the like, from unauthorized places, to put over their kilns, they are fined at least 45 cents, when it is not regarded as an actual theft.

He who leaves standing the wood he was told was for him and takes wood of the same character belonging to another instead of it, has to pay as a fine a sum equal to one-third of the value of the wood carried off by him, if he can not show that it occurred solely through an error.

The penalty for lighting a fire at a dangerous place in the forests runs up to $15, or fourteen days in jail. If a fire, started with or without the permission of the forest officials, is left burning the fine for it is 45 cents, but $1.75 if the fire was among trees less than forty years old. Charcoal burners who do not remove all foliage, heath, moss, or other combustible material from within four steps of their kilns, or do not keep good watch over the kilns day and night when burning or have others do so, or do not always have a barrel of water at hand to put out fire, are fined 87½ cents; and when through their fault their kilns break out into flames, they are fined $2.15. Charcoal burners who knowingly convert into charcoal wood that has been stolen have to pay 30 cents for each cubic meter so used. Charcoal burners who permit wagoners to carry from the forests charcoal in which the fire has not been completely extinguished are fined 52½ cents, and wagoners who do not have a vessel ready on each wagon for putting out fire are fined 32½ cents a wagon.

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For loading a wagon with wood on improper days, or before the customary formalities have been gone through with, the fine is 15 cents a burden or 45 cents a load.

For taking away side products of the forest in a vehicle when only allowed to be carried away, the fine is 45 cents a load.

When wood is not taken away by the time fixed a fine of 22½ cents a load is levied, and the wood can be got off and sold at the cost and risk of the delinquent; but the party interested must have previous knowledge of what follows delay.

Persons to whom loose wood is granted, or to whom out of special considerations building wood is given gratis or for a slight price, are not allowed to sell the same or make charcoal of it without permission of the forest officials, and if they do, are made to pay, as a penalty, a sum equal to the value of the wood disposed of. And so is it if for any particular purpose a person receives wood free of charge or for a slight sum of money and he devotes it to another use, for which he could not have got the wood.

For riding on a forbidden road, except in cases of special necessity, the fine is 15 cents; and for driving there 15 cents for each wheel to the vehicle; and for dragging a sled the fine is 7½ cents for each human being aiding in the dragging, and 15 cents for each animal engaged at it. Similar are the fines for going out of a free or forbidden road. These fines are doubled when the road is departed from if a protected tract of trees less than twenty years old is ridden or driven into.

Whoever without authority walks, drives, or rides into gardens or vineyards or over meadow ground or farm land before the harvest is ended, or upon such farm, meadow or pasture land, or forest tract as is inclosed or provided with signs of warning, or enters a forbidden private way, is finable up to $15 or subject up to fourteen days' imprisonment.

Every individual, having no right there under such circumstances, who is caught in the forests with instruments in his hands for cutting or felling is fined 15 cents; and whoever is caught in the forests committing a misdemeanor or trespass, and found to be armed with gun, pistol, saber, or other weapon is fined $4.30 therefor, and if any misdemeanor or crime is connected with it the offender is turned over to the courts of law for punishment. The interference with persons while in the discharge of their duties in the forests, or the maltreating of them either by word or deed, is a subject for judicial cognizance.

Fines are paid in money or worked out or served out in jail. A day's labor is reckoned at 30 cents, and a day's imprisonment at 25 cents. If a fine is converted into an imprisonment, the imprisonment can not last beyond a year.

Where wood is stolen there is no allowance for damages if the wood is dry or lying on the ground, or, although green and standing, is pressed down by other growth, or has been selected for felling. When seed is taken from uninclosed tracts damages are allowed only when the seeds are obtained by brushing them together or by beating the trees, or by knocking or tearing the seed from the trees; and in inclosed districts, not only in these cases, but even when the seed is simply picked up, is a sum set for damages. There is also no allowance for damages for trespass on meadow or farm land where the harvesting is finished. With respect to a gross trespass no damage is allowed when the trespass does not occur on inclosed tracts, or

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when committed on mowing or meadow ground. For stealing leafage, dry cones or burrs, broom, heath, or other litter there is no sum laid for damages when the stolen stuff has been piled up into heaps by the person entitled to it, or been separated from the ground, or when it has been taken from a place where it was ready for delivery on the payment of its price. No damages are imposed for the taking of sods, stone, or earth, except when it is done on inclosed land. In all cases where much damage is done to side growth or the soil, in the commission of a grass, pasture, or other trespass special, damages are reckoned.

Forest misdemeanors or crimes are tried before the amtsgerichte (inferior courts of justice) without the presence of schöffen.* The office of prosecuting attorney is performed by forest officials designated for the purpose. Each case must, as a rule, be tried before that court within whose circuit the offense was committed. This feature of forest administration is under the control of the judicial department of the Government. The whole course of procedure before these courts I can not undertake to set forth. The accused can be represented by counsel or legal representative, but can be defended only when he is present. The forest officials are generally expected to get judicial authority for making an arrest, but when they come upon an individual suddenly while engaged in committing a trespass, or overtake him while in pursuit of him, and are afraid that he will get away from justice if not immediately captured, or his identity not be afterwards established, they are empowered to take him under arrest, but must give prompt notice of their action to the proper authorities; but it must be an act grave enough to subject the culprit to a fine or to send him to jail. Forest officials are expected not to employ any force in protecting the forests, except when it is done in self-defense.

As said before, those condemned to pay fines can work them out, but they can not be forced to do so. If the fine is not worked out in answer to the summons to do so the delinquent is deprived of his liberty, when no good excuse is offered for the failure to render the service. The labor must be performed by the party fined in person as a rule, and no substitute accepted, except in very special cases.

The forfeits levied and paid in in cash are turned over, after the deduction of the costs of collection, to the proprietors of the forests in which the injuries or trespasses for which they are assessed happened. A third part of the fines imposed and paid in in cash is also given to the parties injured by trespasses after the costs of collection have been taken off, if these people are not already in receipt of a third part of the fines.

BOUNDARIES.

The rangers are charged with the preservation of the boundary marks, and it is particularly enjoined upon them that they see to it that the keepers strictly observe all the instructions they receive in regard to boundaries and their marks, and are required to promptly have all injuries made good; but the refixing of all trigonometrical points is a subject for the surveyors, as is also the establishment of all boundaries and marks. The demesne forests are measured off in two ways into general divisions, and these again into subdivisions. The

*Members of a very small jury.

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first is more for fiscal purposes, while the subdividing has the administration of the forests by the various officials in view.

CONCESSIONS.

The administrators of the forests are often called upon to grant the right to travel or drive cattle through open forests, which the Government allows them to concede, but only in writing and for no remuneration, and with the reservation that the privilege can be recalled at any time, and if the right granted is to be enjoyed longer than the year, the original paper concerning it is sent to the forest bureau at Darmstadt, while copies are retained by the forest officials. The experience of the Government has been that where such grants are carelessly made they often give rise to claims at law. Of course, a right granted for a consideration is a very different matter. It is the duty of the rangers to keep watch over the origination of new rights and keep them in check and prevent the extension of existing ones. All concessions of this nature that they make require the approval of the executive officials. It is also equally their duty to keep alive all rights which the Government on its part holds of a kindred nature.

SALE OF FOREST LAND.

The chief foresters and rangers have no right to sell or dispose of forest land belonging to the Grand Duchy of Hesse or its reigning family; but they can make reports and suggestions respecting the same. They are also forbidden, as a rule, to purchase for themselves or others any forest or agricultural land of good size which might be a good piece of property for the royal household to purchase.

PROCESSES.

Processes in forest matters are conducted on the part of the Government by attorneys at law selected by the forest bureau at Darmstadt, with approval of the finance department.

TAXATION.

The demesne lands are subject to taxation in the same way as the real property and valuable rights of private individuals. The same laws that apply to the latter affect the former in the same manner.

DIVISION OF LAND IN CULTIVATION.

As I understand it, all forest tracts belonging to one owner, which are under the charge or administration of one individual, are as a rule termed a wirthschaftsganzes, that is, an administrative whole.

Trees are generally allowed to grow to the following ages:

Regular forest growth.—Red beeches to 120 years; oaks to 160; yoke-elms, ashes, elms, and maples to 80; birches and alders to 60; other soft foliaceous trees to 40; white-fir to 100; pines and firs to 80, and larches to 60 years.

Topped growth and low growth.—Underwood to 10 years; oak grown for bark to 15; and other low or topped growth to 20 years.

Trees put in among others of a different kind are governed, as a general thing, by the felling age of the species of tree prevailing in that forest, unless they are intended to survive a felling for the purpose of acting as a protection to young growth. When trees are allowed to remain as a protection to young growth, and to grow over to their time for felling, the longest time they are permitted to grow

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is fixed at the time the young growth would be entitled to grow according to the above limits plus their own. Even in the case of oaks the length of time is not allowed, as a rule, to exceed two hundred and fifty years. But there may be peculiar circumstances requiring a departure from this rule. In the forests of regular growth a felling is supposed to take place every twenty years, and the length of time from the appearance of the young trees to the day when they are ripe for felling is divided into periods of twenty years each.

Each wirthschaftsganzes, or administrative whole, is divided into what are known as Betriebsclassen, that is, administrative classes or parts when differences in trees, etc., exist calling therefor. Besides these Betriebsclassen, or administrative classes, there are what are known as ertragsfähigkeitsclassen, that is, classifications according to quality of soil. Of these there are usually not more than three different classes, termed I (good), II (medium), III (poor).

In arranging the forests for purposes of administration they are first considered under the head of area or division, according to soil and stock, respecting which a table is prepared and kept like the following:

Statement of the division of the areas and stock of the —— forests in the range ——.

Districts.			Area.		Quality of ground.	Administrative class.	Description of place of growth and growing stock.	Stock.			
No.	Name.	Division.	Acres.					Age at the beginning of 18—. Years.	Growth.	Close.	Quality.
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*k*	*l*	*m*

The rangers carry from the table of areas all divisions of forest areas in the same order into the columns *a* to *e* of the foregoing form, leaving two empty lines between each district. Only the amount of forest ground is thus carried over in the case of each division. In one of these empty lines, at the close of each district, in the columns *d e* (with the words "roads and ways," in the columns *g h*) is noted the area of the roads and ways belonging to it; and on the second empty line is put the area of the district (with the words "sum of the district" in the columns *g h*). When this is done the rangers, with the unfinished form in their hands, fill up the columns *f* to *m* in the forests. Into this statement a complete description of the stocks of trees and of the place where they grow is expected to be entered and every point noted which will probably be of weight in fixing afterwards the periods of felling and reckoning the amount of product. At the close of these tables their total amount is set forth. If any tract of forest land is without growth it is to be indicated in column *h* by the word "bare," with a statement of the use to which the parcel is put at the time. Where the trees are of a mixed character each kind of wood is to be expressed in tenths of the whole

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stock. In the three columns *k l* and *m* are the words "good," "medium," and "poor" inserted. The sum of this table is afterwards divided up as follows:

Forest ground: Possessing growth; bare of stock.

Not forest ground: Roads and ways; other areas.

The age of the wood is ascertained as far as possible before this table is prepared, and divided into classess for administrative purposes when necessary, and for each class a statement or table like the following is gotten up:

Age table of the ——— forests in the range ———.

Districts.			Age of the stock in 18—.	I. Class (II to V same way) from — and more years. *d* (Also *e* to *h*)			VI. Class from 1 to 20 years.						Bare tracts.		
							With top growth. *i*			Without top growth. *k*			*l*		
No.	Name.	Div.													
a	*b*	*c*	Years.	1.	2.	3.	1.	2.	3.	1.	2.	3.	1.	2.	3.

NOTE.—The Roman numerals indicate the classification as to quality; the Arabic figures indicate acres, say, and the hundredth parts thereof.

For each administrative class, when there are several of them, the columns of the table of ages are specially added up and set forth in a new table, like the following, in which there should be as many leading columns as there are administrative classes:

Summary of the age table of the ——— forests in the range ———.

Number of the class as to age.	Beech forests.						Coniferous trees.					
	Concrete.			Reduced.			Concrete.			Reduced.		
	1.	2.	3.	1.	2.	3.	1.	2.	3.	1.	2.	3.

NOTE.—The same remarks in the preceding form, as to letters and figures, apply to this. To the right follow other administrative classes and sums as before, as well as columns for remarks.

The table, as to ages, is intended to be a faithful presentation of the state of the forest at the time of preparation, and it is therefore required—

A. That each administrative class and group of stock should be entered separately and added up.

B. That each division should be attached to that class as to age to which its age properly belongs; and

C. That at the close an exhibit should be prepared of all the administrative classes.

If one administrative class is converted into another it is then treated as a subdivision of that division to which it will belong after

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complete transformation, and the exhibit which is to be made at the close of the table of ages should contain these subdivisions so that the existing composition of the forest can be exactly seen at a glance. Among trees to be hewn down on the completion of their one hundred and twentieth year all those which are over one hundred years old are to be embraced in the first class as to age; in the case of those whose time is full at eighty years, the first class embraces all those over sixty years old, and so on. If now two administrative classes of different times for complete growth are classed together in one table, those running to one hundred and twenty years are put in a column for the first class as to age, which are from one hundred and one to one hundred and twenty years old, into which column other wood having only eighty years to reach is placed, which is sixty-one to eighty years old; and thus it is with all the classes.

When the statements as to area and age are finished they are forwarded to the directive officers for examination.

In the description of the forests all circumstances affecting them worthy of note are required to be mentioned, and are considered under the following heads: I, area; II, natural situation; III, waters in and about the forest; IV, climate and temperature; V, the soil and its composition; VI, natural peculiarities; VII, historical facts worthy of mention; VIII, proprietary and legal rights and claims; IX, buildings; X, ways, bridges, and the like used, with a statement of the percentage of roads and ways to the total forest area; XI, parts of forest areas not used for growing wood; XII, forest protection; XIII, stock of trees and previous manner of cultivation; XIV, product of wood and the factors affecting the same, with a statement of the relative qualities of soil and their extent; XV, the use and disposition of wood obtained.

In the cultivation of the forests a leading estimate or plan (Hauptwirthschafts plan) is drawn up, showing the divisions of the forest into periods for fellings, so that it can be seen from one year to another in what order the trees come for felling. These plans are gotten up in the following form:

Chief plan of administration of the regular forests of the —— range.

[Inner arrangement, left.]

Districts.			Area.	Age in 18—.	Quality of soil.		Division of the			
							I. Period from 18— to —.		II. Period from 18— to —.	
No.	Name.	Div.	Area.		No.	Comparative number.	Area.	Age at the time of use (average).	Area.	Age at the time of use (average).
			Concrete acres.	Years.			Reduced acres.	Years.	Reduced acres.	Years.

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Chief plan of administration of the regular forests of the —— range—Cont'd.

[Right.]

stock into the different periods.

III. Period from —— to ——.		IV. Period from —— to ——.		V. Period from —— to ——.		VI. Period from —— to ——.				Bare tracts.	Remarks.
						With upper growth.		Without upper growth.			
Area.	Age at the time of use (average).	Area.	Age at the time of use (average).	Area.	Age at the time of use (average).	Area.	Age at the time of use (average).	Area.	Age at the time of use (average).	Area.	
Reduced acres.	Years.	Reduced acres.	Years.	Reduced acres.	Years.	Reduced acres.	Years.	Reduced acres.	Years.	Reduced acres.	

But these plans do not unalterably fix the fellings. They only show from the state of the forests at the time of their preparation how the fellings will presumably occur. The chief object of these estimates or plans is to fix the first period for felling, which is left largely to the judgment of the assessors, and is governed by the normal size of the forests as well as their condition at the time, and local circumstances. And they are expected, in making up their reports, to note every factor having an effect upon the formation of a period for felling, with special attention to the obtainment of a full growth upon areas poor in themselves, or which are carrying excessively aged or other stock whose growth has stopped.

It is also an object of these plans to show how an orderly succession of fellings and a proper classification as to age can be arranged without too great a sacrifice, so that it shall be possible to make up the later periods with stocks of trees of suitable area and age. At the expiration of each period these plans are made out anew, when, of course, the new period of growth springing up is put in the last class, and so on, *ad infinitum*, in rotation. Bare tracts are put in those periods to which they will probably belong when replanted with trees.

In order to make the preparation of these plans easier, and to indicate clearly all postponed fellings, every stock of trees is entered first in the period in which its age places it. In this way such fellings as have to be postponed and run over into another period can have a line drawn through them and their reduced size entered with red ink into that period in which their felling is to take place, and the reason of the change noted under "observations," or even set forth in a special statement when it is not self-apparent. This preliminary exhibit is also submitted to the directive officers for approval, with an explanatory report; and in a clean statement, afterwards made out, the areas of all stocks of trees in whose cases a postponement of felling has occurred are to be written with red ink, just as in the draught.

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All small divisions which, indeed, according to age appertain to the first class, but, from their situation and connection with adjoining divisions, younger in growth, seem best adapted to be placed with them, are taken out of the first class and put into that to which the adjoining trees belong.

All divisions of the second class as to age, and even still younger growth, which, by reason of their character, and from other considerations, should undoubtedly be felled within the next twenty years, are taken out of their class and inserted in the first. This process can also be extended to later periods, when there are excellent grounds for placing the trees in another period to that which their age calls for. The areas as to age resulting from such alterations are compared with the normal size of an age class and period, and the distribution of the classes as to age as existing at the time into the different felling periods is required to be ascertained just as it would be if their normal state were going to be reached in the shortest space of time possible.

For durchforstungen (that is, thinning out forests, or cutting down trees here and there, and not a whole tract at once) and other products of the forest obtained during the various periods until the full time of growth is rounded, a table similar to the following is prepared of such as will presumably take place in the ensuing twenty years; but in the case of oaks an arrangement for following periods can be made out:

Special description of the tracts set for thinning for the periods from 18— *to* ——.

[Inner arrangement, left.]

Order of number.	Districts.			Quality of ground.	Area in concrete size.	Kind of wood.	Age in 18—.	Quality of stock.	Area to be thinned.	Thinnings—solid measure.		
										Estimate.		Result of felling.
	No.	Name.	Div.		Acres.		Years.		Acres.	Per acre.	Total.	

[Inner arrangement, right.]

Trunks and foregrowth to be cut out.				No. of the voucher.	Remarks.
Estimate.			Result of felling.		
Amount of wood (on the whole).	Growth.	Total.			

This table is deduced from the first table, or that relating to area. At the close of the table general observations are made as to what departures from the general rules were made necessary by local circumstances, and as to what the rotations in thinnings will probably

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be. The column under "Remarks" is for special observations in reckoning the productive capacity of the single divisions.

With reference to the improvement of tracts which have only a thin growth of trees a table like the following is prepared, showing what cuttings are necessary in the next twenty years:

Special description of the tracts requiring improvement and of the cuttings necessary during the years ——.

[Inner arrangement, left.]

Order of number.	Districts.			Area concretely given.	Quality of ground.	Kind of wood.	Age in 18—.	Kind of stone, character of soil, situation, and description of stock.	Stock is to be felled in period—
	No.	Name.	Div.	Acres.			Years.		

[Right.]

Improvements.				Description of cuttings to be undertaken.	Products from the wood.	
Method of culture and nearer description of tract to be cultivated.	Kind of wood.	Calculated cost.			Kind of wood.	Solid measure.
		Dolls.	*Cts.*			

The bare tracts of ground are given in a general way in one of the columns of the table, setting forth the classification of trees as to age, but are also the subject of a special tabulation like this:

Special description of the bare tracts, their recultivation, their rotation, and the use made of them in administration of the forests ——, etc., of the —— range.

Order of number.	Districts.			Area.	Quality of ground.	Future kind of administration and class.	Wood to be cultivated during the next 20 years.			Chief use probably occurs.					Use in the mean time.
	Number.	Name.	Division.				Kind of cultivation.	Kind of wood.	Area.	First upon conclusion of the full time for growth.	In the VI period.	In the V period.	In the IV period.	In the III period.	
				Acres.					*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	

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This is for the ensuing twenty years, and if in this period of time any bare tract will not have a regrowth of trees, the reason is to be given in the table. At the close of the table remarks are made as to the order in which the bare tracts follow one another in cultivation and their connection with other divisions.

In Table 2 is a column designated "VI class from one to twenty years," in which is put the young wood growing up under the protection of old trees, to be gradually removed as the young growth becomes able to sustain itself. This process requires a certain length of time for accomplishment, in accordance with local conditions, and the area of the stock of trees already in young growth or being cut for the purpose is expected to stand in arithmetical proportion to this period of time; that is, this area embraces as many imaginary annual fellings as this period comprehends years, and the fractional part of the regular area of the periodenfläche (an area fixed for felling at the end of a certain period) as the years the process of removal is going on do parts of 20, the entire length of the whole period; that is, $\frac{1}{10}$ in the case of 2, $\frac{2}{10}$ in the case of 4, $\frac{3}{10}$ in the case of 6, and so on up to $\frac{19}{10}$, or to the whole extent of a periodenfläche when the process of renewal lasts twenty years. The result thereby obtained the rangers have to compare with the actual or concrete amount of area covered by the trees of this category, which latter is derived from—

(*a*) Those trees of the first class as to age which, although cut for renewal in young growth on account of poor growth, must be put in the same;

(*b*) The entries under *i* in Form 2.

When and in so far as the greater amount of the sums from *a* to *b* are not justified by a relative excess in the first class as to age taken into consideration at the same time with the amount of the following age class, the rangers have to select in the divisions entered in column *i* of the table of classification as to age as many tracts as are necessary to adjust this excess, while keeping constantly in view in doing so the amount of upper growth still on hand, order of felling, and all existing difficulty in the way of new growth. Concerning the stock that remains in column *i* of Form 2, after this is done, a special table is made out as follows:

[Inner arrangement, left.]

Order of number.	Districts.			Area.		Kind of wood.	Age.		Administrative class.	Trunks set apart to remain over.	
	Number.	Name.	Division.	Concrete amount.	Reduced amount.		In the year 18—.	At the time used (average).		Kind of wood.	Number.
				Acres.	*Acres.*		*Years.*	*Years.*			

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[Inner arrangement, right.]

Product in solid measure.					Regrowth.				Remarks.	Number of voucher.
Estimate.				Result of felling.	Through natural renewal.	By cultivation.				
Present stock of wood.	Growth.	Total.	On the average per acre.			Method of culture.	Kind of wood.	Area.		
					Acres.			*Acres.*		

The plan of felling for the administrative (betriebs) classes of cropped or low growth is as follows:

Chief plan of felling and estimate of product, together with plan of cultivation of low growth.

[Inner arrangement, left.]

Order of number.	Chief number of the year's felling.	Number of years — to —.	Arrangement of fellings.						Kind of wood.	Quality of stock.	Age.	
			Number and lit. of the division.	Quality of ground.	In detail (acres).		Total of each felling (acres).				In the year —.	At the time of cutting.
					Concrete amount.	Reduced amount.	Concrete amount.	Reduced amount.				
											Years.	*Years.*

[Inner arrangement, right.]

Product in wood and bark.								Plan of cultivation.			Number of voucher.
Undergrowth.				Upper growth.		Total.		Method of culture.	Kind of wood.	Area.	
Per acre.		On the whole.									
Solid meas.	Tons.	Solid meas.	Tons.	Solid meas.	Tons.	Solid meas.	Tons.			Acres.	

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The estimate as to pasturage and straw is gotten up like this:

Order of number.	Districts.			Kind of wood.	Age in the year —	Area—acres.
	Number.	Name.	Division.			
					Years.	Each year, or each group of years, of which the felling periods consist, receives here a special column, with the figures of the calendar years written above. The sum of the columns gives the area to be used within a certain period.

As to thinnings, the estimate is prepared for the next twenty years in the case of each kind of wood in the following manner:

Age.	I. Quality.		II. Quality.		III. Quality.		IV. Quality.		V. Quality.		Remarks.
	Cubic meters per acre.										
Years.	Chief stock.	Thinnings.	Chief stock.	Thinnings.	Chief stock.	Thinnings.	Chief stock.	Thinnings.	Chief stock.	Thinnings.	

Each year an estimate or plan of the fellings for the succeeding year is made up, and the chief foresters and the rangers are instructed to agree as far as possible with respect to the same. The estimate or plan is drawn up by the rangers, and in the latter part of the preceding year sent by them in duplicate to the chief foresters. The latter go over the completed estimate of the last year, and note all departures worthy of mention, and then transmit both plans to the directive officials. If the rangers do not admit the representations of the chief foresters, the directive officials are at once apprised of it, so that the facts can be inquired into on the ground. The propositions of the rangers for the ensuing year the chief foresters have to examine in a similar manner, and it is desired by the Government that rangers and chief foresters agree as to them as much as possible. If, however, they differ in their views to such an extent that no argument can be reached, the chief foresters are required to return the estimates or plans of the rangers to them, with their objections, within eight days after their receipt, who, as soon as possible after they get them back, and at least not later than ten days thereafter, proceed to lay the matter before the directive officers for decision. These either give at once their decision or refer the matter to one of their number for disposal, or to a chief forester. When the chief foresters agree with the rangers as to the plans or estimates they send them back to the rangers with their approval. This empowers the rangers to go on with their operations, but the chief foresters have to submit a general review accompanied by a

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report to the directive officers and the plans may be changed by the last-mentioned in certain details. This general review is in form as follows:

[Inner arrangement, left.]

No.	Names of the sections or possessions.	Forest area.				Regulated etat.	In 18— was felled.		Fellings of wood for 18—.					Side uses.	
		Regular forest growth.	Low growth.		Bare tracts.		Above	Below	Fire wood.	Wood for building, etc., exclusive of bark.	Useful bark.	Total.	Average per acre.	Pasture.	Straw.
			Oaks for bark.	Other low growth.			The estimate.								
		Acres.	Acres.	Acres.	Acres.	Solid measure.	Solid measure.		Solid measure.					Acres.	

[Inner arrangement, right.]

Renewal through natural growth.		Renewal by art.						Ditches serving for inclosures or carrying off water.	Expenses.				Observations.
		Area.		Seed, including requirement for seed-beds.			Plants.		Cultivation.	Highways.	Forest-ways.	Boundaries.	
Kind of wood.	Area.	Complete cultivation.	Improvement.				Foliacous wood.	Coniferous wood.					
	Acres.	Acres.	Acres.	Pounds.			100 plants.		Yards.	Dollars.			

This is based on the following returns, made by the rangers:

District.] *Plan of cultivation of the forests of the Ducal House for* 18—. [Range.

Description of area.	Area in wood.	Ways.	Total.
	Acres.		
Regular forest growth			
Oaks grown for bark			
Other low growth			
Bare tracts			
Total			

A.—*Fellings of wood.*

The annual estimate, as adjusted, amounts, according to No. — of the forest bureau of the ———, 18—,

In regular growth to .... solid measure. chief product. .... solid measure. intermediate product. .... solid measure. on the whole.
In topped growth to .... solid measure. chief product. .... solid measure. intermediate product. .... solid measure. on the whole.

Total .....do .....do .....do.

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Result in 18—.

Fellings.	Should have amounted in solid measure—			Really gave finished off—							
				Up to ——.				To end of year.			
	Chief product.	Intermediate product.	Total.	Chief product.	Intermediate product.	Total.	Difference in totals, ±.	Chief product.	Intermediate product.	Total.	Difference in totals, ±.
Regular growth { Regular											
Regular growth { Extra											
Topped or low growth { Regular											
Topped or low growth { Extra											
Total											

Adjustment of departures in general and in detail.

No.	Ranger's proposal.	Result of revision.

Survey of the fellings arranged.

Number of the plan of felling.	Number and lit. of the districts and divisions.	Building wood and timber.		Fire-wood.																
			Total.	Wood, — inches in diameter.					Wood, — inches in diameter.				Wood, — inches in diameter.			Brushwood or sticks.			Total.	Grand total.
				Beeches, etc.	Birches, etc.	Oaks.	Coniferous trees.	Aspens, etc.	Beeches, etc.	Birches, etc.	Coniferous trees.	Aspens, etc.	Beeches, etc.	Oaks, etc.	Coniferous trees.	Beeches, etc.	Oaks, etc.	Aspens, etc.		
			Solid meas.	Loose measure.					Loose measure.							Solid meas.			Solid meas.	Solid meas.
Total																				
Cost of gathering in the wood for each foot sold.																				

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Summary survey of the result of the operations in 18— in the forests of the Grand Ducal House forest ——.

[Inner arrangement, left.]

Name of the range.	Whole area of forest land.	I. Natural renewal.			II. Complete cultivation.			III. Improvement.			IV. Nurseries and seed-beds.	Ditches for drainage and inclosure.	
		Area.	Costs.		Area.	Costs.		Area.	Costs.			Length.	Costs.
			Total.	Per acre.		Total.	Per acre.		Total.	Per acre.			
	Acres	*Acres*	*Dolls.*	*Dolls.*	*Acres.*	*Dolls.*	*Dolls.*	*Acres.*	*Dolls.*	*Dolls.*	*Dolls.*		*Dolls.*

[Inner arrangement, right.]

VI. Purchase and preservation of implements.	VII. Other costs.	Amount of costs.		Materials in cultivation.				Bare tracts.	
		Total.	Per acre.	Seeds.		Plants.		At the beginning of the year.	At the end of the year.
				Foliacous wood.	Coniferous wood.	Foliacous wood.	Coniferous wood.		
Dollars.	*Dolls.*	*Dolls.*	*Dolls.*	*Per pound.*	*Per pound.*	*Per 100.*	*Per 100.*	*Acres.*	*Acres.*

Forest ——.] *Forests of the Grand Ducal House.* [Range.

Special survey of the —— of the operations —— for 18—.

No. of plan of culture.	No. of district, No. and lit. of division.	Area.			Material.									Ditches for drainage and inclosure.	Other expenditures.	Costs.				
		Natural renewal.	Seed.	Plants.												Per	In detail.		Total.	
		Acres	*Acres*	*Acres*												*Cents.*	*Dolls.*	*Cts.*	*Dolls.*	*Cts.*

The following subjects are treated of in the general annual review and accompanying report of the chief foresters in as brief a manner as possible:

(1) The carrying out of the previous year's plan, and the result as well with respect to fellings of trees as their cultivation.

(2) The new plan of operations, with special reference to previous administration, to the state of the forests and their present and future

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productiveness, as well as the possibility and means of improving the quality of the wood and increasing its productiveness, to obstacles in the way of improvement, and necessity for carrying out the methods of cultivation suggested.

(3) Side products, especially such as pasturage and straw or litter, prospect for seed and its disposition, particularly respecting a better use of such products.

(4) Disposal of forest products, obstacles in the way of doing so, prices during the past year, and prospective price for the coming year.

(5) To what extent the forest products required are obtained, and what the prospect is for their continuance.

(6) Natural occurrences, unfavorable weather, and other mischances of the past year, so far as they exercised an influence upon the forests.

(7) The state of boundary marks and lines and the necessity for their preservation.

(8) What fellings took place during the year just closed, what counts were made, what auctions were held and wood delivered, and when they began and when they came to an end.

The rangers, as executive officers, are responsible for the execution of their plans according to rule, and are not allowed to depart from them without the concurrence of the chief foresters; and even these have no right to agree to change plans specially decided upon by the directive officers without the approval of the latter. If for any reason the plan of operations can not be carried out to the letter, or should be departed from, the rangers are powerless to do anything themselves, but must have recourse to their superiors for authorization. After a plan of operations has been carried into effect it is the duty of the chief foresters to see that it has been properly done.

In each financial period an estimate has to be made out of receipts and expenditures for the next period with a comparison of the figures of the last one. These estimates are of two kinds, annual ones and triennial, the latter being the financial period of the ducal government. The first is called a periodischer voranschlag (periodical estimate) and the latter the annual estimate. The first, as I understand it, is for submission to the legislature and its action. Then comes the annual estimate, whose limits are fixed by the legislative action on the chief estimate, as the appropriations made are in general not to be exceeded.

CONTRACTS.

The rangers make the contracts for wood-cutting—that is, the prices that are to be paid—which contracts need the approval of the authorities at Darmstadt only when the wages to be paid for the different kinds of wood exceed the maximum fixed by the local administrators, and are responsible for an exact compliance with the whole of the felling etat approved. Departures are allowed only when they do not exceed 5 per cent. of the etat through increased or diminished results in forests of cropped growth or through events which could not be avoided. Of the fellings provided for in the plans of operations no one is to be left undone without approval of the chief foresters. But departures from the individual items of a plan of operations are permitted when they are caused by differences in the products of the various fellings up to 50 per cent. of the estimate, by an increase or diminution of the product fixed for the year in a for-

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est of cropped growth, and by wind or trespass. Violations of the entire estimate up to 10 per cent. are justified when the chief foresters and rangers are agreed as to the same.

FELLINGS.

The rangers and the keepers have, as a general rule, to mark the wood that is designed for felling, and the rangers are expected to watch all fellings, and see that no improper ones take place.

The rangers have the sorting and preparation of the wood to attend to, have to keep a record of all wood felled, and of the cubic amount of building timber.

The wood-cutters are engaged by the rangers, who are not allowed to do or permit anything to be done injurious to the forests; and whenever they know of a trespass, they have to report it to the rangers or keepers. All forest fires the wood-cutters have to endeavor at once to extinguish, and when it is not possible to accomplish this, then to promptly make the proper parties aware of their existence. They have to aid their superiors in discovering and capturing trespassers. They are not allowed to carry any wood from the forests. They are not permitted to make any fire in the forests between the beginning of April and the end of October, nor in very dry weather, and then only at such times and places as their superiors admit; and for every ten men not more than one fire is allowed. Each fire is to be no larger than is absolutely necessary, and to last only until mid-day, and not to be fed with anything but chips and shavings and such slight stuff as falls from the trees, and for at least one yard all around the fire all leaves, moss, dry grass, and the like must be removed. On leaving work or the place of fire it must be carefully put out. The wood-cutters are forbidden to take ashes with them. Smoking is allowed only in the case of closed pipes. They are not permitted to remain after night-fall where wood is being cut without the cognizance of their superiors. In cutting wood they are divided into squads of not less than six men each, one of whom acts as boss, and these men are all answerable for whatever occurs among them until the actual author is fixed. The wood-cutters can fell no tree until directed to do so by a superior.

The wood that is felled is all numbered, generally each lot separately, but several lots can sometimes receive the same number. The wood is numbered either successively as the different parcels are felled and can be counted off by the rangers in their tours of inspection, or afterwards by them when it has been prepared and assorted. The first method is preferred. If a felling is so extensive that it is convenient to divide it up into lots, or if a part is delivered by direction of the directive officers before the entire felling is through with the numbering has to take place immediately. When there are different kinds of wood in a felling two sets of numbers are used, one for building wood and the other for fire-wood; but when wood that is not to be used for fuel is from its nature liable to become confounded with the latter, continuous numbering takes place and a note made thereof in the reckoner's check. When the numbers run beyond 999 a special number is allowed when the wood is of such a character that it can not get mixed up with any other. The numbering is attended to by the rangers, who have the numbers put on the wood by the workmen with paint or red crayon or struck into the wood with a mallet.

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Every distinct felling is given a separate number (Roman), just the one that it bears in the plan of operations for the year, which numbers run seriatim in each ranger's district, and have to agree with the numbers of the corresponding counts that are made of the wood felled. If, through any cause, intermediate numbers in the plan of operations for the year are not used, the numbers given to the wood that is felled must nevertheless agree with the number given the felling when proposed the preceding year in making up the plan of operations, and the intermediate numbers must be skipped. The very small fellings are embraced together quarterly under one number. All fellings occurring from October 1 to September 30 form the fellings of the year, and are reckoned in the fiscal year beginning six months previously. For each keep where wood or other products will probably be taken from the forests in the course of the year the rangers have to have two books, styled number-books, one for building wood and timber, and one for fire-wood, so that the keepers can easily write in them the products expected in their several keeps, and the rangers have to give these books to the keepers before counts take place. These books are gotten up in the following way:

(Title-page.)
Forests of the (Grand Ducal House). Range ——. Keep ——.
Products for the year 18—.
Number-book of the —— wood, kept by keep ——.
Begun { the receipts on.....
the deliveries on.....
Closed { the receipts on.....
the deliveries on.....

Inner arrangement of the book for building wood and timber in the case of large quantities.

Receipts, building wood and timber.						Deliveries.
Sort.						
Tariff price.			At $——.	At $——.	At $——.	Manner of delivery, special estimate of value per ——, receiver, and other remarks.
No.	Dimensions.					
	Diameter.	Length.				
	Inches.	Yards.	Solid measure.	Solid measure.	Solid measure.	

This form contains eleven vertical columns for a number of different kinds of wood and assortments, and takes up two pages of the number-book.

For a small number of different kinds of wood another form is employed, differing from the foregoing only in this, that it embraces but five vertical columns in the place of the eleven mentioned, and takes up but one page.

In the case of fire-wood, where there are a large number of differ-

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ent kinds of wood and assortments, the number-book is arranged as follows:

[Part 1.]

No.	Receipts.							Fire-wood.					
	Wood, in diameter.							Wood, in diameter.					
	Beeches, ashes, maples.		Birches, fruit-trees, elms, acacias.	Oaks.	Coniferous trees.	Alders, aspens, poplars, lindens, willows.		Beeches, ashes, maples.	Birches, fruit-trees, elms, acacias.	Oaks.	Coniferous trees.	Alders, aspens, poplars, lindens, willows.	
	Solid measure.												

[Part 2.]

Fire-wood.									Deliveries.
Small wood.					Sticks.				
Beeches, ashes, maples.	Oaks.	Coniferous wood.		Fire-bark.	Beeches, ashes, maples.	Oaks, birches, fruit-trees, elms, acacias.	Coniferous wood.	Alders, aspens, poplars, lindens, willows.	Manner of delivery, special estimate of value per ——, receiver, and other remarks.
100 bundles, solid measure.									

Where there are only one or two kinds of wood to be entered the form is as follows:

No.	Receipts.								Deliveries.
									Manner of delivery, special estimates of value per ——, receiver, and other remarks.

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Then, besides these books there are special Abzählungsprotocolle (minutes of counts), which have to be made up by the rangers, and differ from a number-book in these respects, that they are confined to one felling or one important number, while the number-books take in an entire keep, and serve chiefly for recording the receipts in wood, while the number-books serve also as a register of wood delivered. In these minutes the wood is entered according to the lots into which it is divided up. In them are noted, too, all lessening of prices owing to changes in the quality of wood. These minutes remain in the possession of the rangers, while the number-books are held by the keepers until all deliveries of wood are through with. The rangers are responsible for the full and proper count of all wood.

The amount of wood felled and sold has to be entered as numbered by the keepers in the number-books as soon as properly prepared and numbered. The books are then summed up, compared with the delivery-checks of the bosses over the wood-cutters, and then handed to the rangers with these checks. The rangers then go over them and see that the entries are all right, when they permit the wood to be delivered; but none is allowed to be taken away until counted off by the rangers, who have to count as it lies all wood felled, make up their minutes therefrom, and have the number-books tally therewith.

As the rangers count the wood they strike or have it struck with the hammer they carry with them, mentioned in the first part of this dispatch, as an indication that everything is all right. As these number-books are for a whole keep, the keepers or the rangers in their behalf, before any entries are made, have to write in each new case, between cross lines, its date, the name of the district, the number of the division, and the Roman numbers of the felling, and separate each count from those between which it occurs by double-cross lines. The columns of the number-books relating to the delivery of wood the keepers dare not fill out until the count has been completed. In the column of remarks all decreases in the price of wood owing to change of quality have to be noted.

If standing or unassorted wood is delivered in consequence of special authority, it must be carefully valued for entry in the number-books, etc., in the same manner as other wood, and the remark made in reference to it that it was not regularly assorted or cut.

With respect to small fellings, the rangers at the beginning of each quarter have to make up a record, and small wood thrown down by the wind or carried off by trespassers has to be estimated and entered in this same record as well as in the number-books.

When intended fellings do not take place the numbers given them in the plan of operations for the year are entered in the hand-book of natural receipts, and where the results of the fellings would be written the reasons have to be given for the failure to fell.

Each record (Abzählungsprotocolle) is kept separate by itself, and on its cover are noted the dates of the close of the felling, of the delivery of the number-books to the keepers, and the count made by the rangers.

These records of counts are forwarded to the chief foresters, but before it is done the rangers have to enter in what is called a hand-book of natural receipts a summary of them.

Within eight days after the completion of a count the rangers transmit to the chief foresters the minutes of the same without any

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accompanying report, who return them to the former within three days after their receipt, after making a record of their substance.

After the minutes of a count are forwarded to the chief foresters no rectification therein can be made until the ranger and keeper concerned have concurred in a certificate, signed by both of them, to their chief forester, setting forth the alteration that should be made, which, after it has been signed and approved by the chief forester, is annexed to the original minutes, and the minutes corrected in the proper place with red ink.

The chief foresters are obliged, either before or after the counting of the wood, to look at least once in the presence of the ranger concerned, at the larger and more important fellings, and see that all rules are being observed.

For all errors in the minutes of counts the rangers are responsible.

At the close of the felling season all minutes of counts are bound together in one volume, which are kept by the rangers.

Bark is also counted and recorded.

All side products which are reckoned by the lot or piece have to be counted and recorded by the rangers in a similar manner to wood.

The rangers, without the previous written approval of the chief foresters, have no right to change any part of the annual plan of operations; but slight differences in the costs of cultivation of the forests and in the number of trees planted on a particular spot, which must necessarily arise, are excepted. The making of contracts with respect to the cultivation of the forests rests with the rangers, as do the employment and dismissal of workmen, and require the approval of superior authority only when they exceed prescribed limits. The procuration of culture material is also lodged with the rangers, so far as it does not have to be obtained from the magazine at Darmstadt or from other forest districts, and needs approval only when the prices fixed are exceeded. The rangers are responsible for the proper cultivation of the forests, and have to fully instruct the keepers who have the superintendence of the various pieces of work as to what is to be done and how to be done, and are responsible for all failures on the part of the keepers to have a piece of work properly performed when the failure arises through incomplete or obscure instruction, and also for all delays on the part of the keepers which they have not reported with promptness to the chief foresters.

At Darmstadt there is what is called a central seed magazine, from which the forest officials get seed when necessary. At the close of their plans or estimates for each year the chief foresters are required to make out an estimate of the amount of seed that will be needed in their respective districts, independent of that gathered in their forests. They are expected to obtain whatever seed is necessary from their own forests when it is possible, and procure in the forests seed of fine quality when it can be done at less expense than through the magazine at Darmstadt, and in sending in their plans or estimates the foresters have to indicate where they think they can get good seed at reasonable rates. Then whatever is required from the magazine is supplied either directly from it or through its agency, and the forest officials have to inform the magazine whenever they learn of good opportunities to purchase fine seed.

With respect to young trees for planting the forest officials have to provide not only for immediate wants but for the demands of several years, and they are charged to keep constantly in view the re-

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quirements of successive years that will probably arise and make provision for their satisfaction, and they are required to carefully observe how young trees are best brought up, and to collect seed with care. Not later than the 15th of August of each year the rangers have to send in a statement to the foresters showing what young trees can be delivered by them and what they are in want of. From these the chief foresters have to send in to the forest bureau at Darmstadt not later than the 1st of September a list of such young trees as are required in the respective ranges of their districts. What is requisite the central bureau at Darmstadt has supplied.

The conversion of the products of the forests into money is left to the rangers, under the control of the chief foresters. The wood of the Government forests, as a rule, is sold at public auction, and no wood is supposed to be disposed of until properly counted and recorded. Wood sold privately in the Government forests is sold according to a tariff fixed by the Government, which tariff is prepared every three years. The rangers are expected to get all auctions through by August. If the bids reach seven-tenths of the price set for the wood in the tariff or of its estimated worth, the rangers are empowered to make the sale, otherwise they submit a report to the chief foresters of the bids made and ask whether they shall accept them or not. If the rangers and chief foresters are in agreement the matter is closed, but if not, it is laid before their superiors for decision. Each ranger generally auctions off the wood of his district. When an auction takes place of products from different ranges one ranger is designated to attend to it. In the first case, a forest-keeper has to be on hand as a check to sign the minutes of the sale with the officiating ranger; in the latter, another ranger takes the place of the keeper. The sale generally occurs at the place where the wood or other forest products are. Those whom the foresters know to have been behindhand in their payments on previous occasions for wood bought, or to be without means, are not allowed to bid. And if bidders are seen to organize among themselves for the purpose of affecting prices the sale can be declared off. The wood is not allowed to be taken away until the money is paid, but sometimes an exception is made, but even then it can not be taken away until a paper is presented showing that the holder is entitled to have the wood. At the expiration of fourteen days whatever has not been paid for can be again auctioned off at the expense of the original buyer. From the day of the auction to the time of delivery of the wood into the custody of the buyer the Government sustains all losses arising from theft or other causes.

The small wood of the forests the poor are allowed to pick up free of charge.

Side products are disposed of in pretty much the same way as the regular wood. They are generally auctioned off, except when of very insignificant value.

The taking of litter from the forests is considered as a rule to be prejudicial to them in a greater or less degree, and only exceptionally of advantage. It is therefore kept in bounds as much as possible.

Tree plants are generally sold privately, as they are of too slight value and there is too little competition for them at auctions for them to be auctioned off.

The seed of coniferous trees is disposed of at public auction.

In forest culture the mast is of great importance, for on it depends

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the rejuvenation of the forest. The foresters were therefore enjoined in 1843 to have the mast gathered up in all forest districts of the Government where there was not enough on hand for the natural renewal, to be done in the case of beeches by leasing out the mast for an appropriate natural rent, or exceptionally by paying for the collection of the mast; and in the case of oaks, to be achieved by the payment of small wages for the collection of the acorns, or by making culprits, fined for misdemeanors in the forests, gather them up. And it was ordered that the poorer classes of the country might have an opportunity to compete for the leasings of beach mast; that those forest districts wherein such mast could be collected should be divided up into such parcels that the poor could lease them for a natural rent. They are to be rented for money when no one will take them on natural rent, and the collection of the mast for compensation would amount to more than the nuts could be bought for. The beech acorns or nuts are gathered as soon as possible, as they do not keep well over winter. As a rule the beech trees are not allowed to be beaten for their seed, but only shaken.

The right to forest pasturage depends upon old rights or special agreements, and is everywhere subject to forest police control. Where they are leased they are given to the highest bidders under the following conditions:

The pasture can only be used by one herd under charge of its special herdsmen or keepers, and the herd can not be broken up into parts for pasturage. A number of individuals can unite together into one company for the purpose of obtaining and enjoying a pasturage in common. Lessees are responsible for all damages brought about by their herdsmen or animals. The use of any other way or ground than that granted by the lease subjects the offender to a penalty. Releasing or the taking of associates is forbidden unless consent is first obtained. The lessees, when required by the rangers, have to indicate the bounds of their pasture by wisps of straw. No goats or strange cattle are to be taken with the rightful herd upon pasture ground. The herds are not to rest long enough in one place to do mischief. Animals can not be pastured before the break of day or after nightfall. When the rangers consider it necessary they can forbid even the use of leased pasturage without the aggrieved party thereby acquiring a right to damages. Herdsmen guilty of misdemeanors have to be discharged when the rangers demand it, and others substituted for them.

Grass and fodder are generally disposed of at public auction.

With respect to grass-seed, it is provided that in those ranges in which grass-seed appears in such quantities that a good sum would probably be realized from its sale at public auction, the seed is auctioned off just before it becomes ripe.

(1) In all closes where it is thought young trees would be very likely injured by the collection of grass seed.

(2) On all grass plats where the grass has been leased or can be much better employed in feeding cattle.

(3) All forest tracts which have been leased for pasturage or on which claims to pasturage lie.

Forest land is sometimes temporarily used for agricultural purposes. Where it is not necessary to any extent the use of forest land is limited to such cases where temporary cultivation of it agriculturally is quite necessary in fitting the soil for forest growth, Where, on the

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other hand, the needs of the community require the land for agricultural cultivation to a considerable extent, it must be allowed, although not necessary for the benefit of the trees that are to follow, though useful, and not detrimental to them. The character of the soil and its situation must also be taken into consideration, as well as the manner and time of recultivation with wood. The duration of the use of the land agriculturally is subject to the chief end had in view, namely, the cultivation of forest trees, and is not to be any longer than is consistent with this object, and no briefer than is necessary to realize the product had in view in devoting the soil to agricultural cultivation. The manner of use the soil is put to and the product has also to be considered. While the young trees are growing the soil on which they stand is oftentimes given over to agriculture. As a rule, however, the cultivation of wood and of field products must occur simultaneously. It is only in exceptional cases allowed to plant agricultural products first and forest products afterwards.

Where the Government has forest land for temporary tillage it rents it out to the highest bidder.

The forest keepers, in the strict sense of the word, have nothing whatever to do with forest accounts. The real administration of the forests is intrusted to the rangers, under the control of the chief foresters. All accounts have to be kept clearly and cleanly, and no words or figures are allowed to be scratched out with a knife, but only to have a line drawn through them in such a way that the original words and figures can be easily read. Besides the number-books already mentioned each ranger has for each fiscal year a special day and memorandum book, in which has to be entered all forest products, with the amounts of money converted into receipts as well as all expenditures, so that the book will always present an exact exhibit to date. The first part of the book is devoted to natural receipts and the delivery thereof, with the prices received. These books, at the beginning of the administrative year, are put together, paged, and bound for preservation, and they must contain all items which the rangers require in making up their annual accounts. The second part of the book is for credits received by them and payments made, or rather debts incurred and certificates of indebtedness given, as the rangers make no payments of money, but simply certify what is to be paid by the exchequer. These certificates the rangers are responsible for when mistakes occur and transmit them to the financial offices for settlement.

The chief foresters also keep day and memorandum books divided like those of the rangers, into two parts, the first having reference to the products of the forest converted into receipts, and the other to expenses. They are called control, day, and memorandum books.

The local forest officials keep an account, which has to be sent in, of all wood converted into receipts. They are prepared by the rangers, embracing the Government forests as well as corporative and private forests in which the Government has a pecuniary interest.

Then there are administrative accounts which are known as special or general accounts. The object of these accounts is to show how estimates have been observed and appropriations applied, and every departure from the budget's provisions must be justified. Their names indicate their character. They show, one specially, the other generally, how money appropriated has been used.

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COMMUNAL FORESTS.

I have been treating all along particularly of the forests belonging to the State or its reigning house. I have now to make a few remarks with respect to communal or corporate forests. By the expression communal forests is meant in Hesse all forest land belonging to cities and country communities as well as that held by endowed institutions and corporative bodies of all kinds. These are under the charge of foresters also specially educated for the work and examined by the State. They are administered in pretty much the same manner as the state forests, and are subject to similar authority, but the communes and corporations have a voice in their management, and the department of justice is their highest authority.

The rangers in the administration of the communal forests in technical concerns are not subject to the magistrates and communal officers, but to the superior forest officials, whose instructions they have to implicitly obey; but they are required to ever keep in mind that they are managing the property of strangers, and that they should endeavor to take care of the forests in the interest of the common weal; that while they are not expected to obey the commands of communal officers they should treat them with all deference and bring their wishes to the attention of the superior forest officials, and to give communal officers whatever information they desire respecting the conduct of their forests. The forest officials have to decide how much wood shall be allowed to be cut, as a rule, in each communal forest every year.

These forests can not be changed in character, divided up or aliened, except with the approval of the forest officials. Each year estimates are prepared by the rangers and submitted to the burgomasters of the probable receipts and outlays in their respective forests during the succeeding year. These estimates the burgomasters present to the people's representatives, and communicate to the rangers the results of the latter's deliberations thereon. The rangers then send the whole thing to the chief foresters for their examination and consideration. When the local revisions take place, the burgomasters are invited to be present, when they desire it. Afterwards the burgomasters are furnished with an abstract of the estimates or plan of operations for the ensuing year. A general review or abstract of these plans the chief foresters send to the forest bureau at Darmstadt. If in considering and preparing these estimates, or plans of operation, the various parties having the matter in hand fail to agree, they are forwarded, when no agreement can be come to at all, to the forest bureau at Darmstadt.

The officials of this bureau then communicate with the bailiwick courts on the subject, and if they do not coincide with their views the courts turn the matter over to the department of justice, at Darmstadt, for decision. The plans are then carried out by the rangers as decided upon. In all cases where the rangers have to mark felled communal wood with their forest hammers they have to invite the burgomasters to accompany them in doing so, so that the latter can have it struck with the communal hammer if desired.

The wood-cutters in the communal forests are appointed by the owners of these forests or their representatives, under the control of the rangers, and these workmen must be experienced men whenever

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the work to be performed requires skilled labor. The pilers have always to be approved by the rangers.

The burgomasters, as I understand it, make the contracts for fellings, which is done four weeks before the cutting begins, by letting it out to the lowest bidders, as a rule. This felling is done under the superintendence and control of the rangers. The numbering of the wood is done by the rangers, or under their direction, in the same manner as in the governmental forests, without the co-operation of the burgomasters. For each keep there are two number books, one for building wood and timber and the other for fire-wood. After the keepers have made their entries, and found them te be correct, they turn them over to the burgomasters for inspection. For each leading number of a count the burgomasters have to make up minutes, consisting of a transfer to them of what is contained in the number books, in which, however, several numbers having the same dimensions and the like price can be combined together in one item. The number books and minutes employed are like those in the case of the governmental forests. The certificate reads, however, as follows:

Forest of ——— Commune. Forest ———, Range ———, Keep ———.

Felling for the year 18—. Minutes of count No. ——.

District ———, Division ———. Close of felling on ——, 18—. Entered in the number book on ——, 18—. Control count made ——, 18—, in the presence of ranger ———.

Turned over to the burgomaster's office on the ——, 18—. Found correct with ——— solid cords and recorded.

Burgomaster's office; name of commune; forest keeper.

The minutes are then sent to the rangers, who make a control count of the wood, in the presence of the burgomaster, the forest keeper, the special piler, and boss or head of the squad of wood-cutters. The rangers carry the burgomasters' minutes, the burgomasters the number books of the forest keepers. When all is found correct the minutes and number books alluded to are signed by the ranger, burgomaster, and forest keeper concerned. Afterwards the keepers get the number books, and the burgomasters the minutes. What is contained in both the rangers enter in a control book. The small fellings are only recorded quarterly.

SEED.

The rangers set forth in their annual plans of operations what seed will probably be required, and what kinds and what quantity will have to be purchased, and report what will be needed from the grand ducal magazine. The communal authorities, or owners of communal forests, have to pay for the seed a price sufficient to cover the expense of purchasing, keeping, handling, and sending the same.

From the state seed magazine only the seed of coniferous trees can be procured, as well as under certain circumstances the seed of such foliaceous trees as are adapted to the purpose, such as the seed of the maple, ash, alder, and the like. Whatever other seeds are required, especially the seed of the oak, beech, etc., is to be obtained from the lowest bidders at public auction or by contract privately made. This is attended by the burgomasters in conjunction with the rangers. The rangers have to fix the conditions of delivery, examine the quality of the seed, and provide for its care until the time

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of sowing. Plants as a rule are not allowed to be bought from private dealers.

For the purpose of encouraging the cultivation of tree plants by combining nurseries for fruit-trees with forest gardens, the chief foresters are authorized in all cases where communes, with the approval of the bailiwick courts, desire the establishment of such nurseries of fruit-trees, to favor them.

DISPOSITION OF WOOD.

The conversion into money of the wood and other products of their forests is left to the communes. The forest officials have only to regulate the deliveries and to watch out for the interests of the proprietors as well as to co-operate in fixing the scale of prices. These scales of prices or tariffs, so far as the same kinds and sortments of wood are concerned, as in the governmental forests, are gotten up in the same manner as those for the governmental forests, and the prices are determined by those realized in the locality at auctions where there is free competition. The sketches or draughts of them are drawn up by the rangers, who at once communicate them to the burgomasters. The latter lay them before the councilmen for consideration. When the councilmen are through with them they are returned with their views to the rangers, through the burgomasters. Then the rangers go over their draughts again, and consider them in connection with the suggestions and desires of the communal authorities. When this is through with they send them to the chief foresters, who in their turn transmit them with their views to the kreisrath, who settles the thing.

The views and desires of the communal authorities are conformed to as much as possible. These tariffs must run at least a year, and are expected to last for a series of years, with a revision every six years. They are for use in determining the price of wood when it is disposed of in any other way than at public auction, and their prices are not to be less than the average prices received at public sales. All wood is generally disposed of at public auction, as are other forest products.

The rangers keep a record in a control book of all wood and other forest products converted into natural receipts in the communal forests. They also keep a memorandum or control book of expenditures.

CONVERSION OF FOREST LAND TO OTHER PURPOSES.

With respect to the conversion of governmental and communal forests to other purposes there are no special statutory provisions, and the matter rests with the forest bureau of the finance department at Darmstadt and with the department of the interior and of justice. The fundamental doctrine on the subject, however, is that only such parcels of forest land are to be permitted to be devoted to other purposes when the soil is particularly adapted to agriculture and the remaining forest will not be injured by the change and no other disadvantages arise, such as the scattering of sand, the washing down of earth from the hillsides, etc., nor any unfavorable influence be exerted upon the climatic conditions prevailing in that quarter.

SUPERINTENDENCE OVER PRIVATE FORESTS.

The members of the nobility and patrimonial tribunals have the right to administer their forests pretty much as they please.

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With respect to private forests of the second class in the provinces of Starkenburg and upper Hesse the owners have the right to manage them largely independent of the State, but are governed by the following regulations:

They can not convert forest land into agricultural without previously obtaining the permission of the Government to do so. When they desire to fell a piece of forest land and leave it bare for a few years, using it as farm land, with a view to preparing it for resowing with tree seed, they do not require any permission to do so from the forest officials, but must notify the rangers of their intention, to avoid being prosecuted for clearing, and so that the forest officials can see whether the circumstances making a request for permission unnecessary really exist. But the piece of ground can not remain longer than three years in this condition unless the Government permits it.

If a party fells his trees in such a way as to indicate a destruction of the forest, without having obtained permission to do so, the local foresters have to apprise the directive officials, and in pressing cases to simultaneously obtain an injunction from court. When an owner unauthoritatively destroys his forest or fails to sow or plant the ground after felling for a new growth, after the lapse of the proper time, the forest officials have to see that it is attended to, and either make the owner do it or do it themselves at his expense when he neglects to obey their commands; but he is still left the right to choose the kind of seeds or trees which shall be planted, and is always invited to be present when the planting is carried out. If he does not name the kind of tree he desires to grow on his ground, the forest officials will take whatever sort they think proper.

When an owner of forest ground denies the charge of having destroyed his forest, he can demand that the question be settled by the decision of a board of three persons, consisting of a local official, a forester from some other district, selected, by the forest bureau at Darmstadt, and a forester named by the party accused. Their decision must be submitted to the government at Darmstadt when rendered, and must contain an expression of opinion from each member of the board. If the opinion handed in is unfavorable to the party in whose case it is given, he must bear all costs arising from the arbitration.

All patches of forest separated from the main forest by houses, gardens, farms, meadows, or vineyards, and not greater than one hectare (2½ acres) in extent, are not subject to the foregoing provisions of law, and the owners can fell such tracts whenever they please without permission.

Owners of private forests are required to mark with wisps of straw or by ditches during the time of closure, when directed to do so by the forest officials, and to show the police of the place, before the opening of pasturage, the order to close, a list of which exhibits the police have to communicate to the rangers every year. The closures the owners of the forests have to observe as well as others, but have the right to take grass, litter, etc., with the foreknowledge of the foresters, when no injury is done, even in those parts of the forest under closure.

In Rhine-Hesse the law is that no forest is to be devastated or destroyed without permission, with the exception of small parcels separated from the main forests. The owner has to make good the damage, pay 6 franken for each square ruthe, and cease working the

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land cleared; and whoever without authority cultivates bare forest land loses the harvest, pays a fine of 3 franken per square ruthe, and has to let the land lie as forest land.

All forest decrees or regulations affecting owners of forests reach also those enjoying rights under them. Only when a party claiming under another exceeds the rights lodged in the principal will the forest officials ordinarily interfere. Such cases it is said occur but seldom, and in the most of instances the forest officials interfere with such parties only by command of court (in a cause of action). With respect to such rights the general rule is that they are not to be exercised in such a way as to endanger the very existence of the forest and render it valueless to the possessor and thwart the very object for which it is designed, namely, the cultivation of forest trees, which rule is especially applicable to the gathering of straw and the use of pastures. In regard to the latter, those holding pasturage rights must permit the closing of one-third of the whole quantity of ground given over to pasture irrespective of the quality of the various parts and without any exceptional claim to the uninterrupted use of any particular part of the entire pasture.

CONCLUSION.

The laws of Hesse, the minister of state of the Duchy informs me, respecting the forests are contained in the publication entitled "Handbuch für die Forst-und Cameralverwaltung im Grossherzogthum Hessen" in the form of regulations. This book I shall transmit to the Department.

JAS. HENRY SMITH,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Mayence, July 5, 1887.

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